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Guillemette

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(54) **REINFORCEMENT MEMBER FOR A DOOR, DOOR REINFORCEMENT SET, DOOR REINFORCEMENT DEVICE, DOOR FRAME REINFORCEMENT KIT AND DOOR SECURITY KIT**

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E05B 17/20 (2006.01)
E05B 9/00 (2006.01)
E05B 15/02 (2006.01)

(52) **U.S. Cl.**
CPC ***E05B 17/2084*** (2013.01); ***E05B 9/002*** (2013.01); ***E05B 15/0205*** (2013.01)

(58) **Field of Classification Search**
CPC E05B 17/2084; E05B 15/0205; E05B 15/0245; E05B 9/002
See application file for complete search history.

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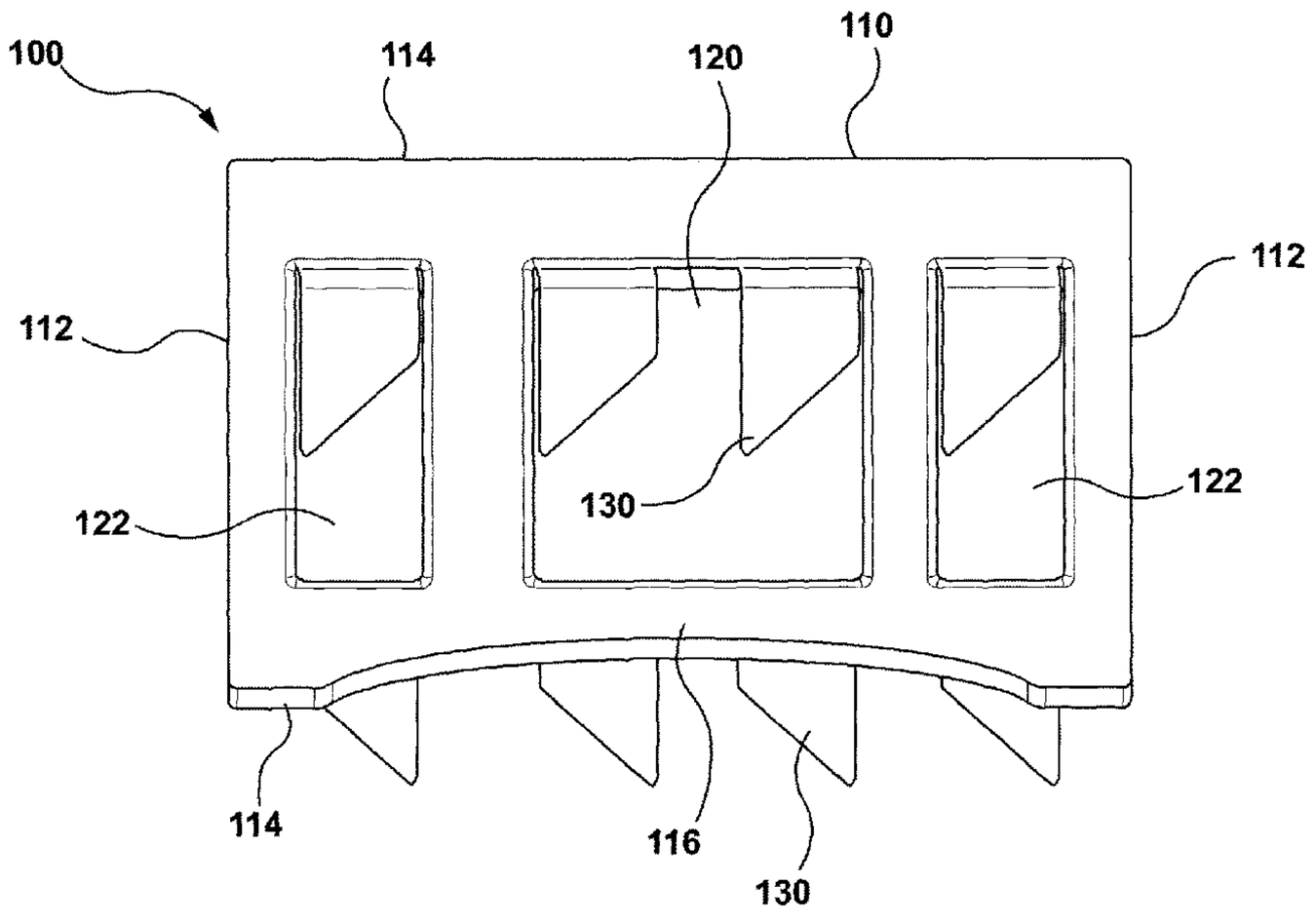
(57) **ABSTRACT**

A reinforcement member for a door comprises a plate having a plurality of hooks extending on one face of the plate. The reinforcement member is shaped for mounting on a door stile or on a strike jamb of a door frame, on one side of a locking member opening. The reinforcement member is maintained on the door stile or on the strike jamb by insertion of the hooks in a material of the door stile or strike jamb. A set may include a pair of reinforcement members for placing on both sides of the locking member opening. Two members may be integrated as one piece via a pair of bridges, or integrated in a faceplate or a strike plate. Kits may include the reinforcement members and a back plate for mounting behind a door frame with screws.

3 Claims, 24 Drawing Sheets



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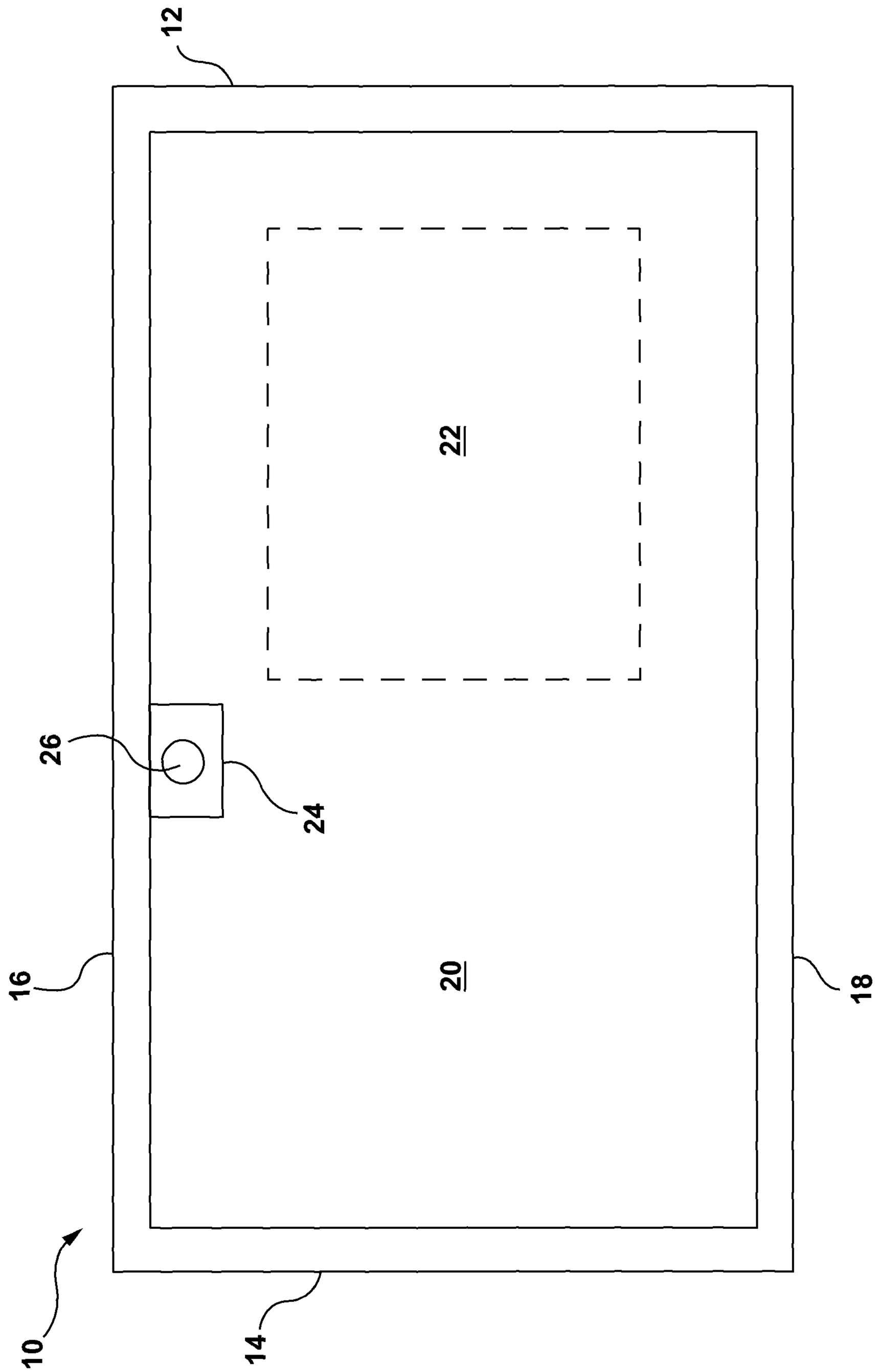


Figure 1 (Prior Art)

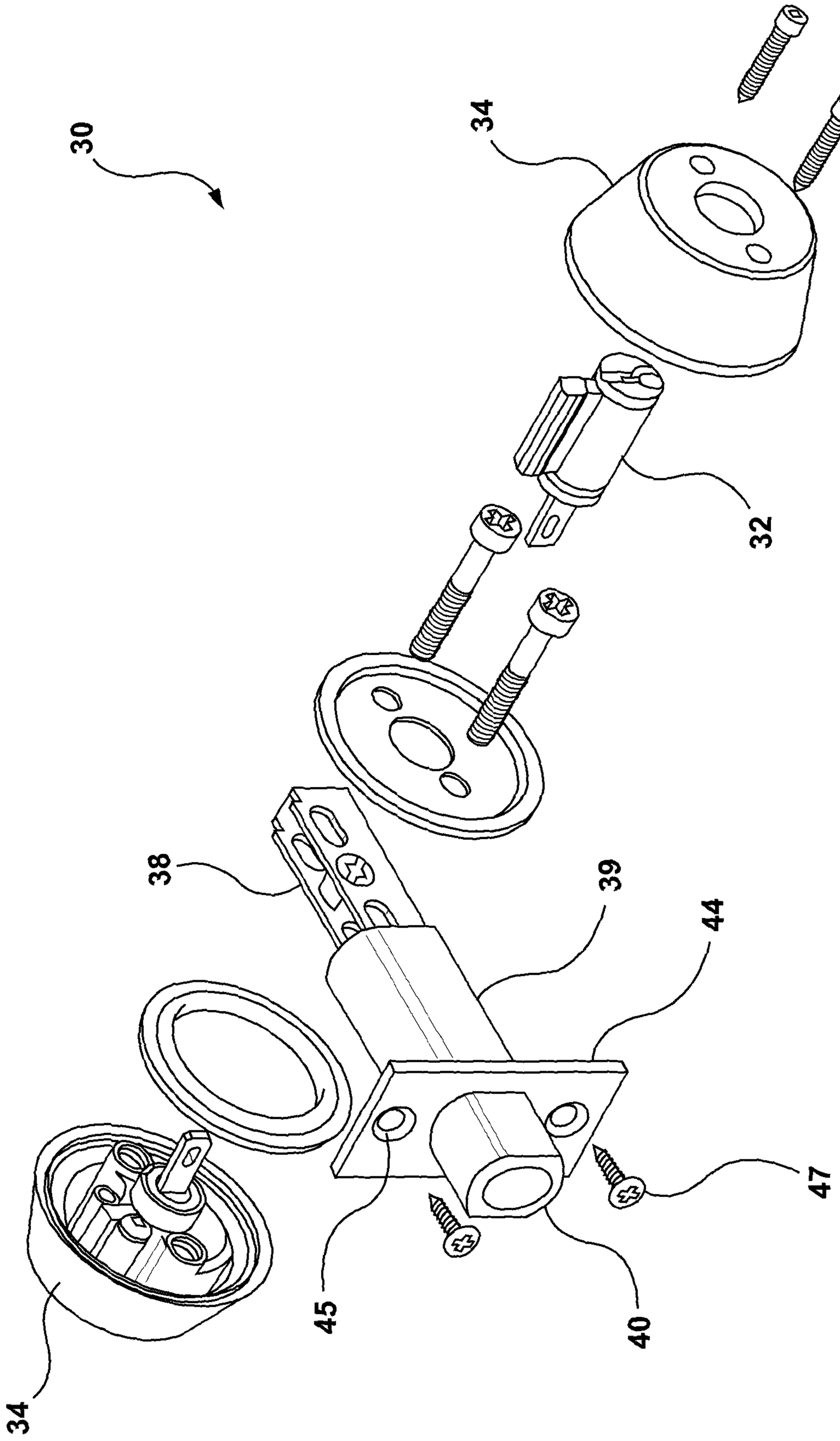


Figure 2 (Prior Art)

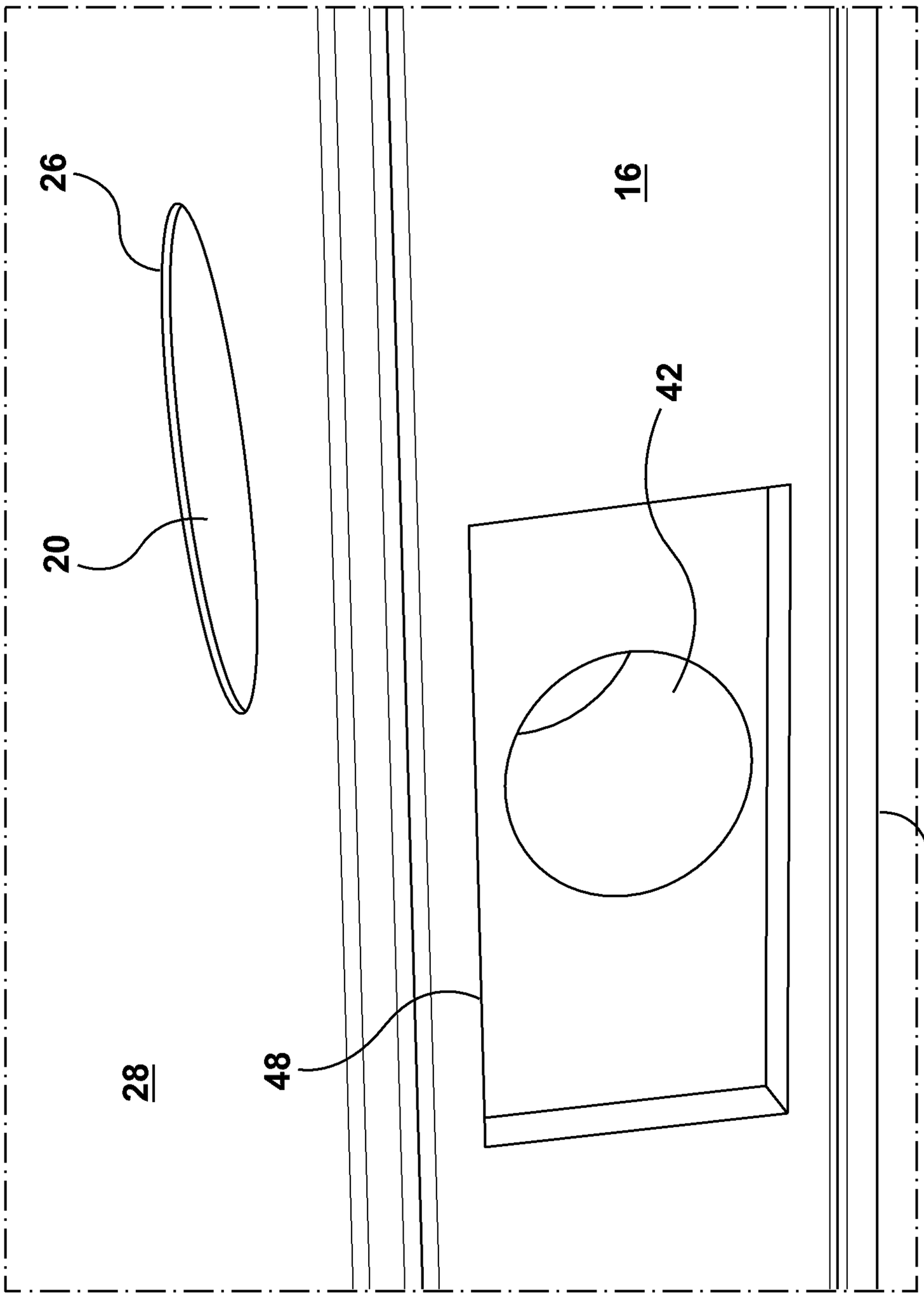


Figure 3 (Prior Art)

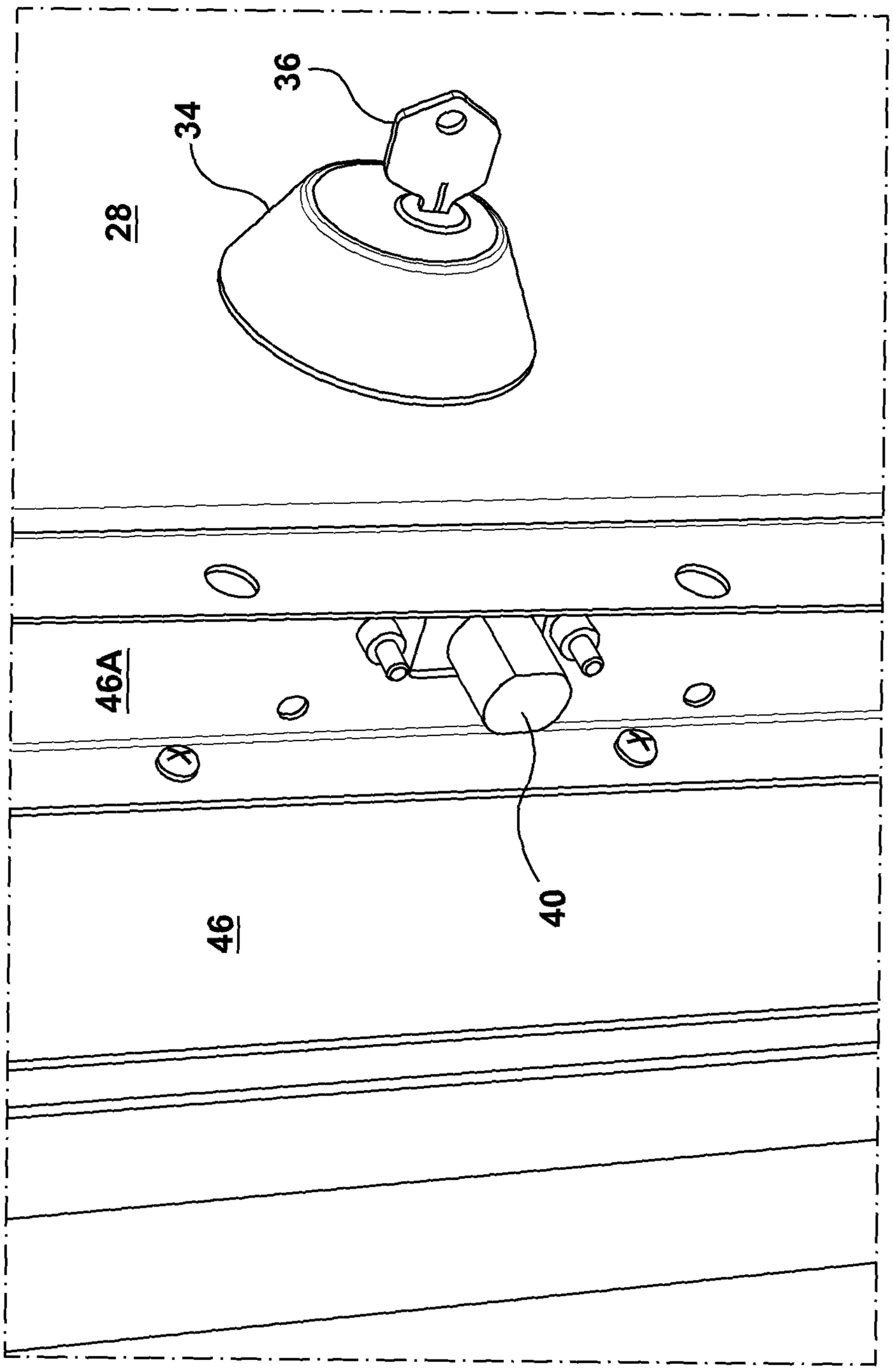


Figure 4 (Prior Art)

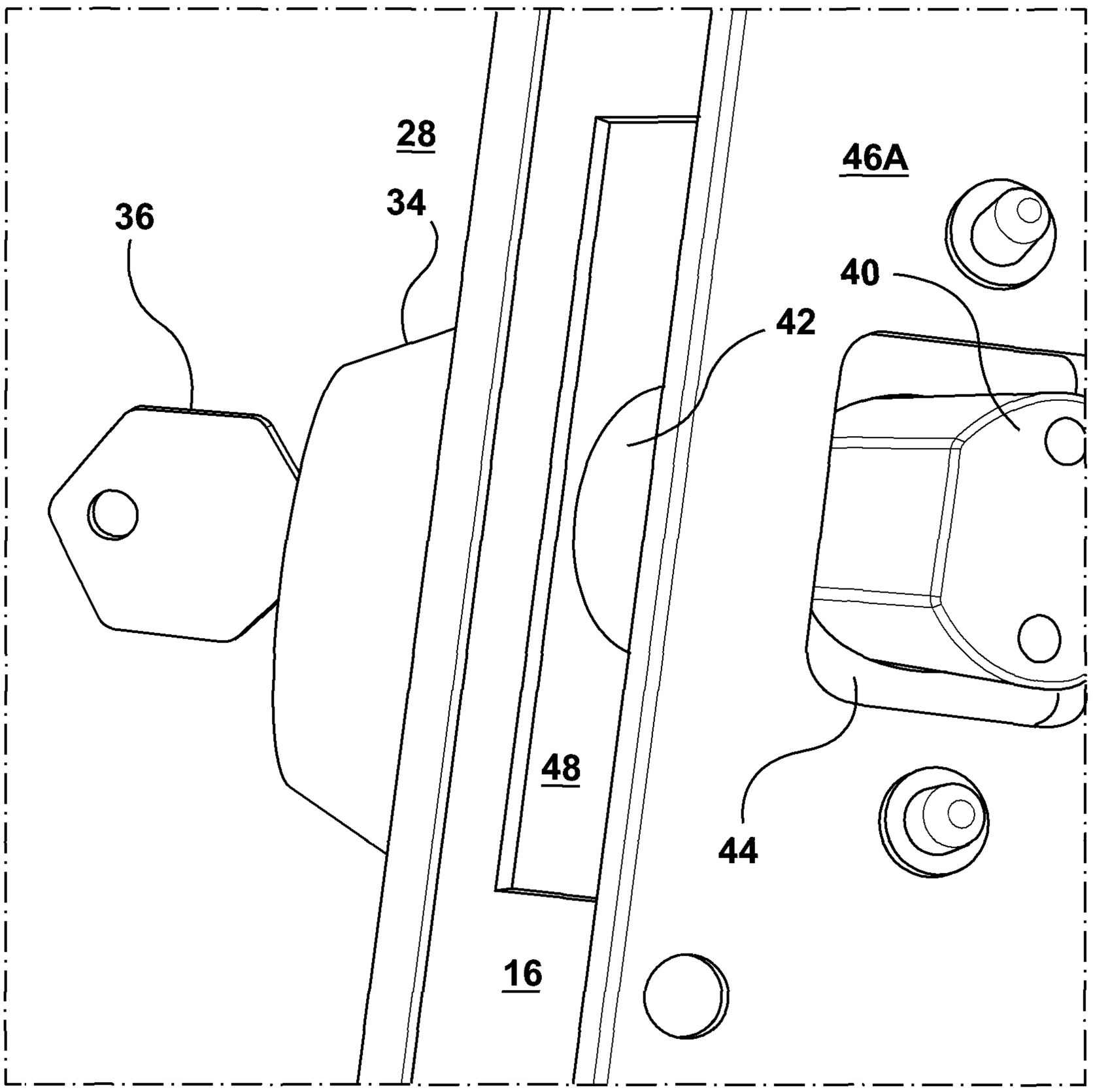


Figure 5 (Prior Art)

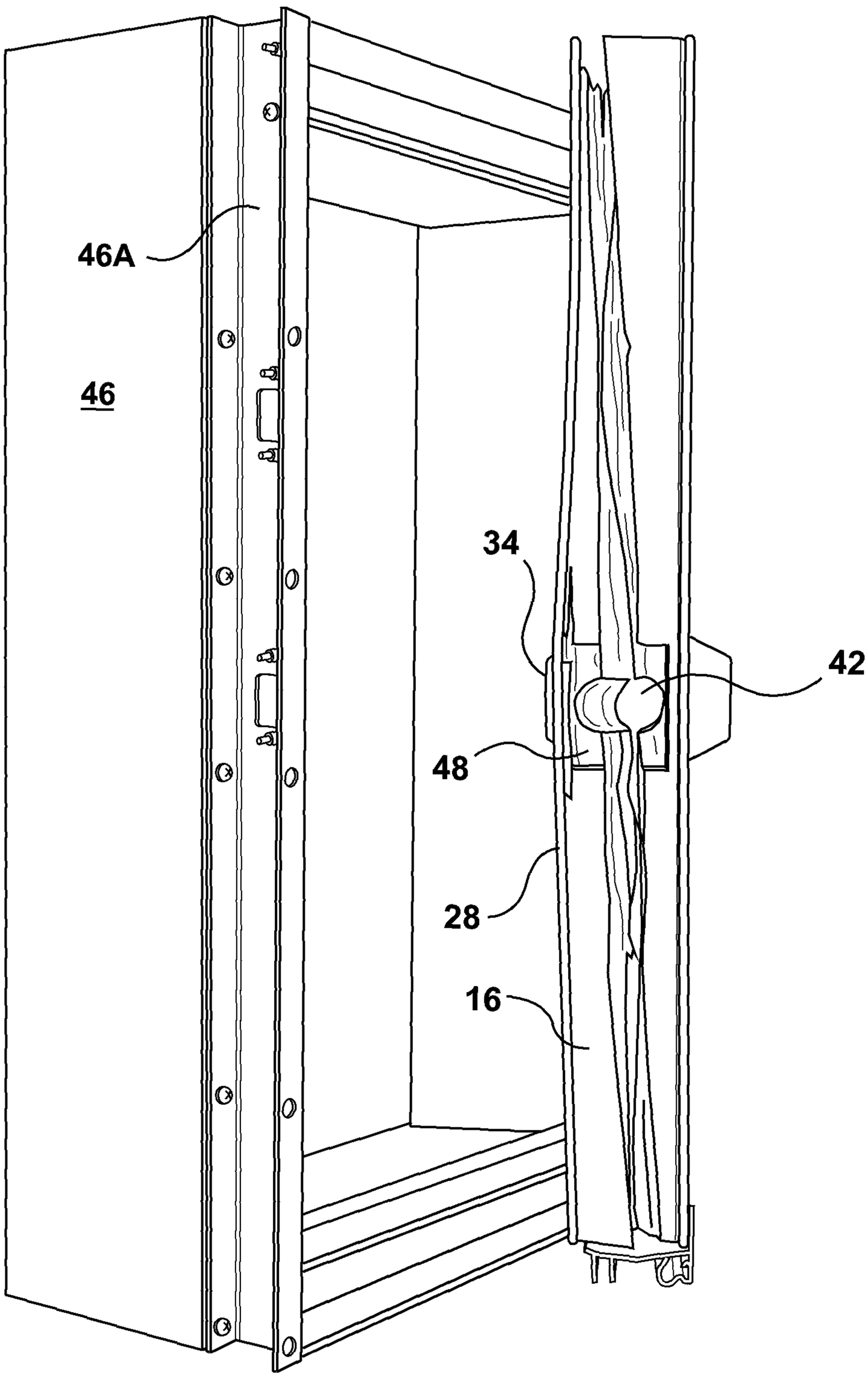


Figure 6 (Prior Art)

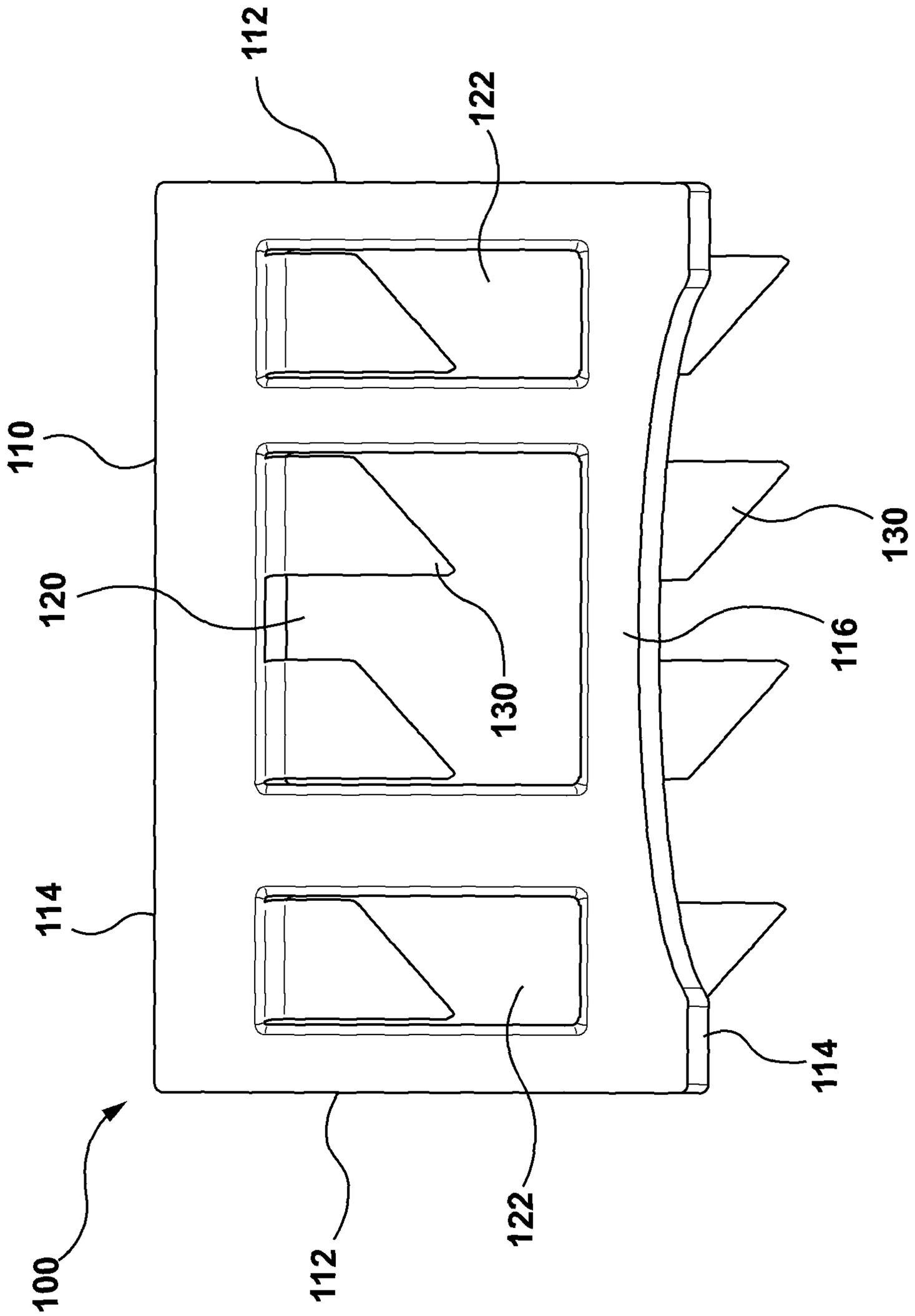


Figure 7

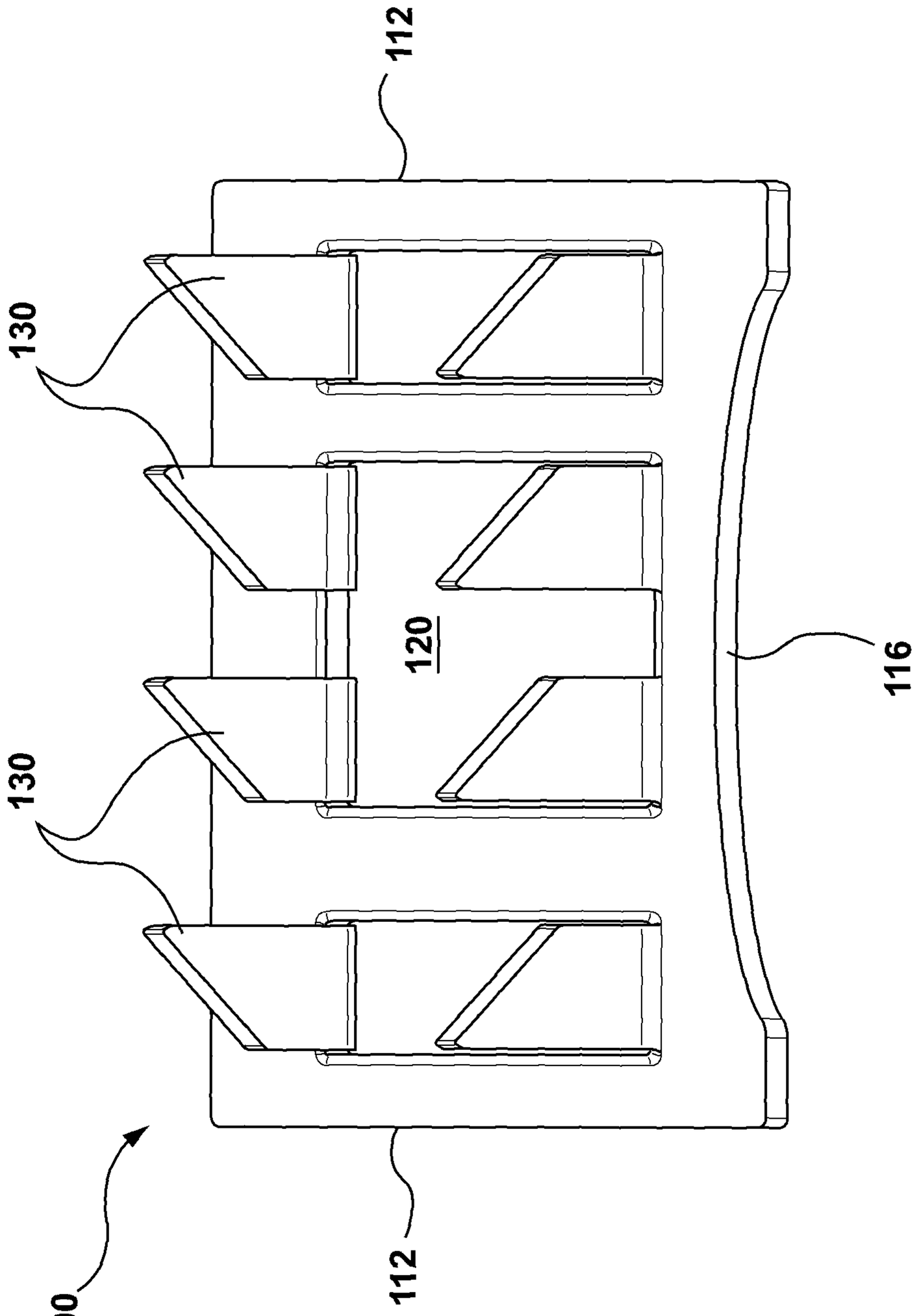


Figure 8a

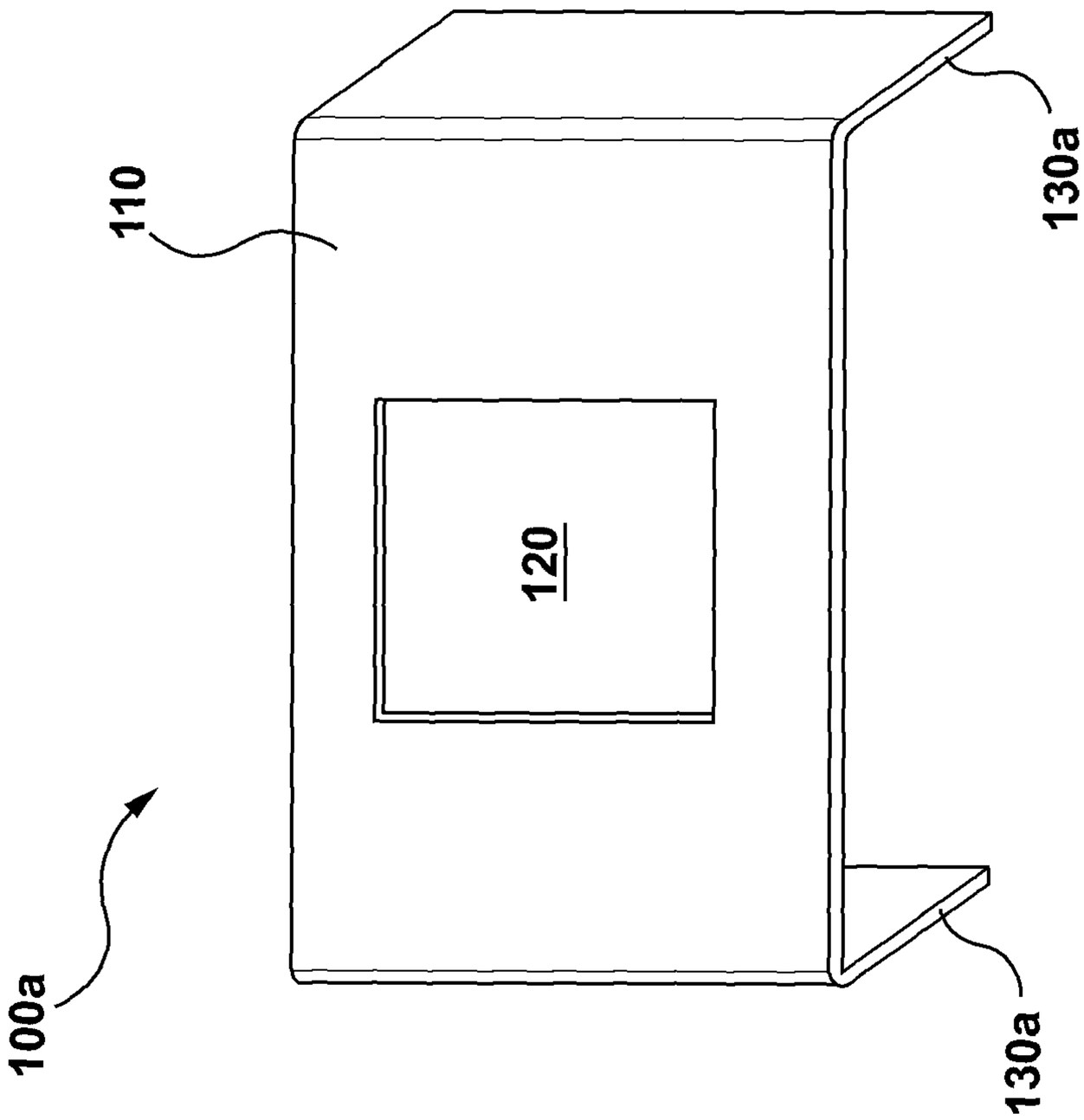


Figure 8c

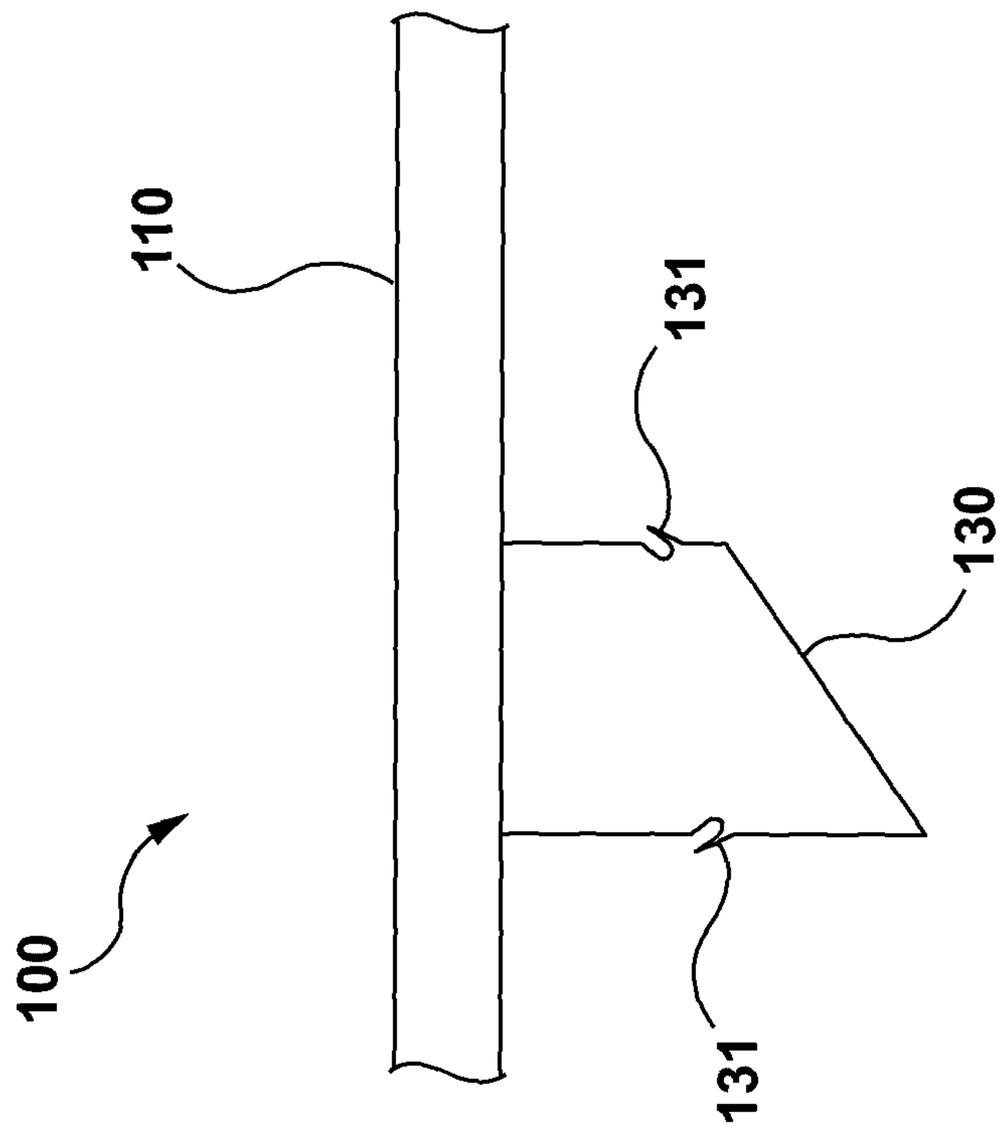
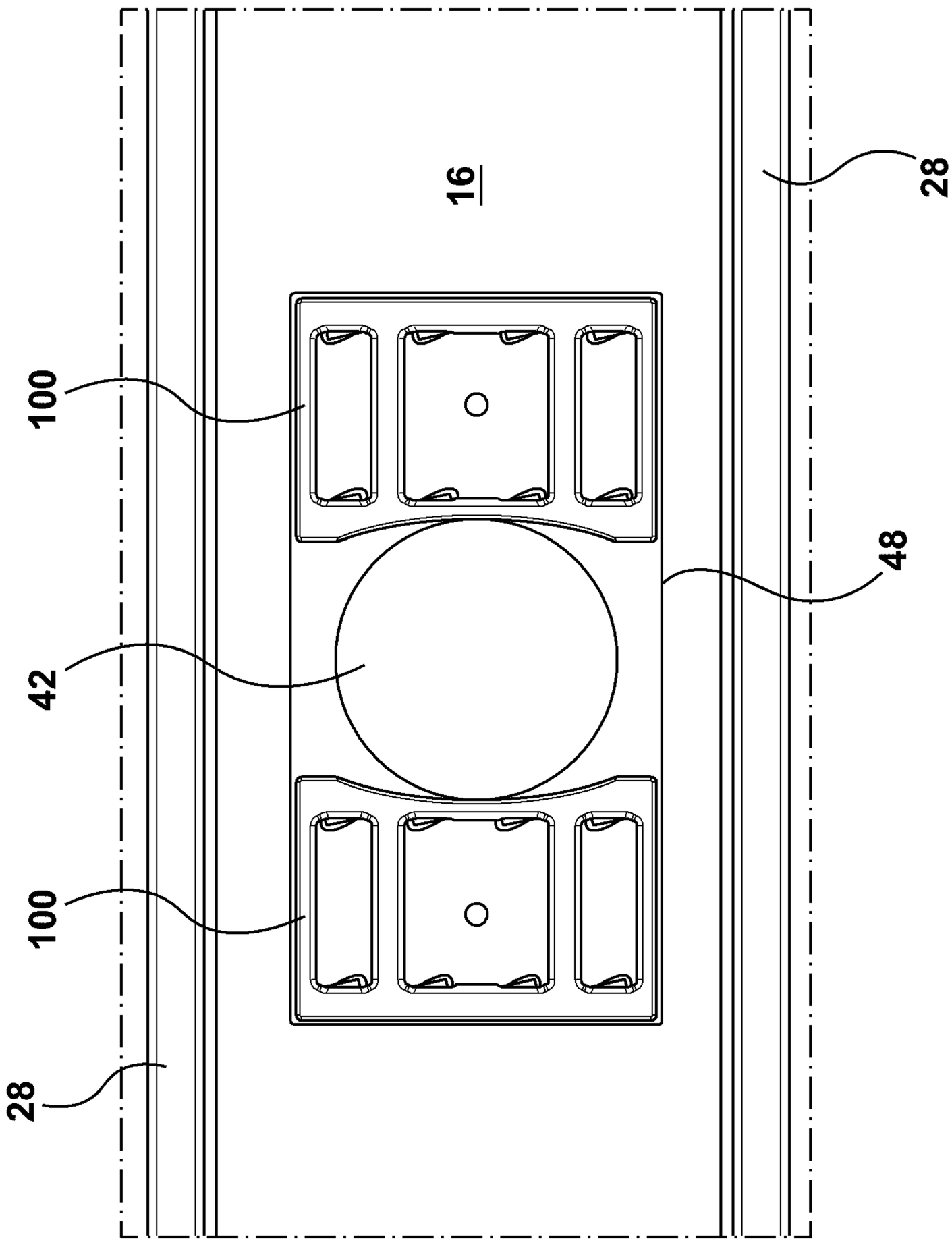


Figure 8b



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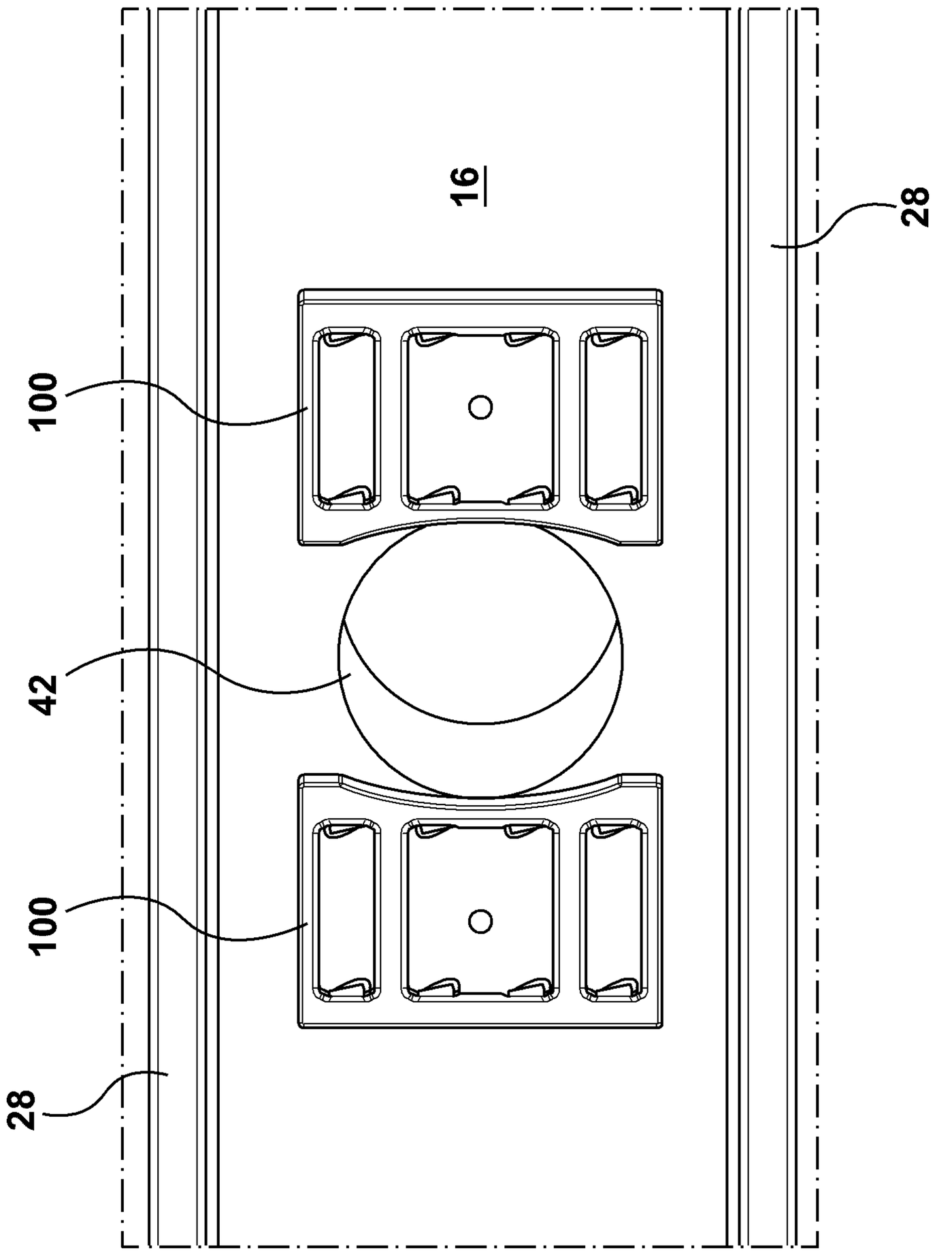

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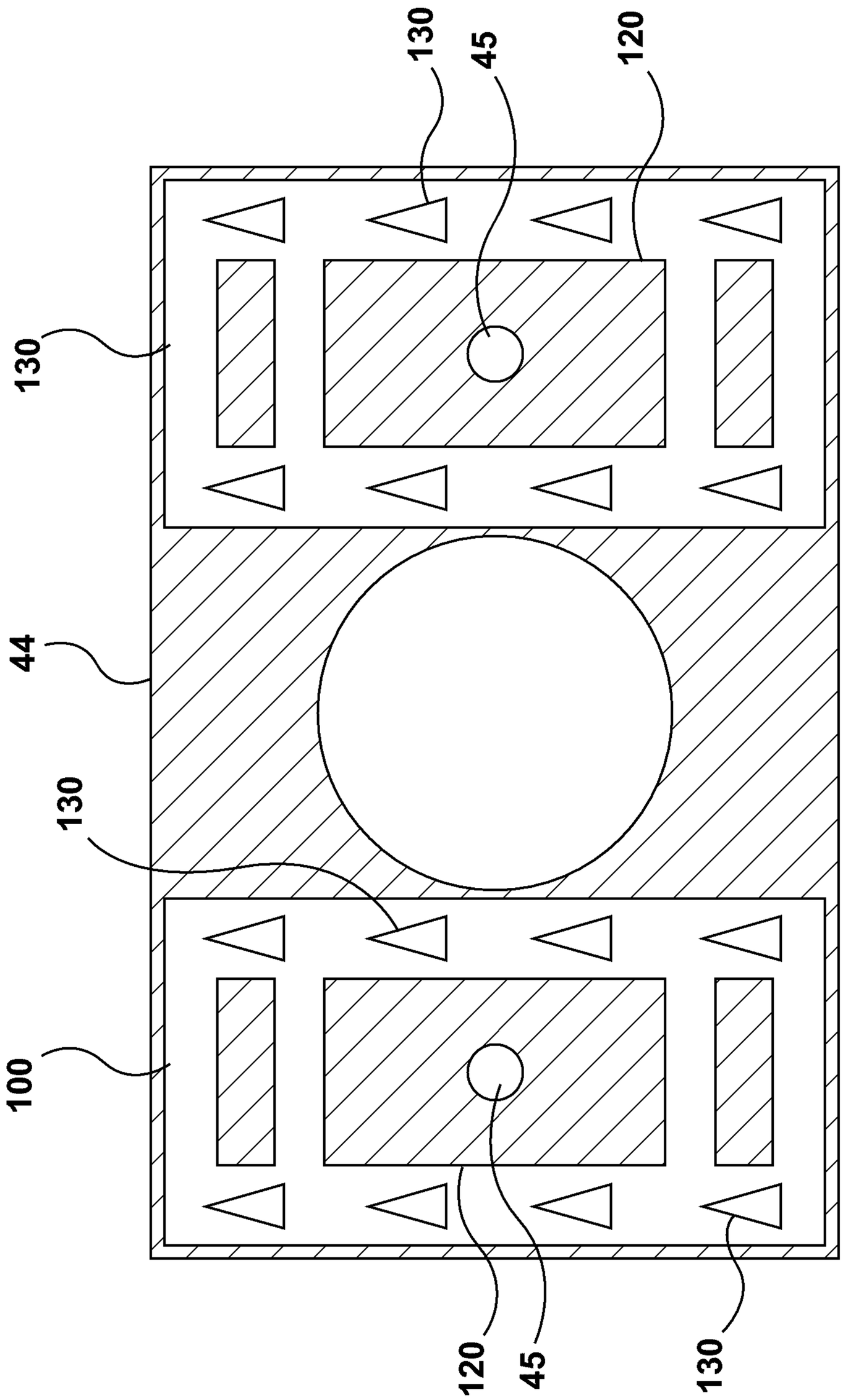

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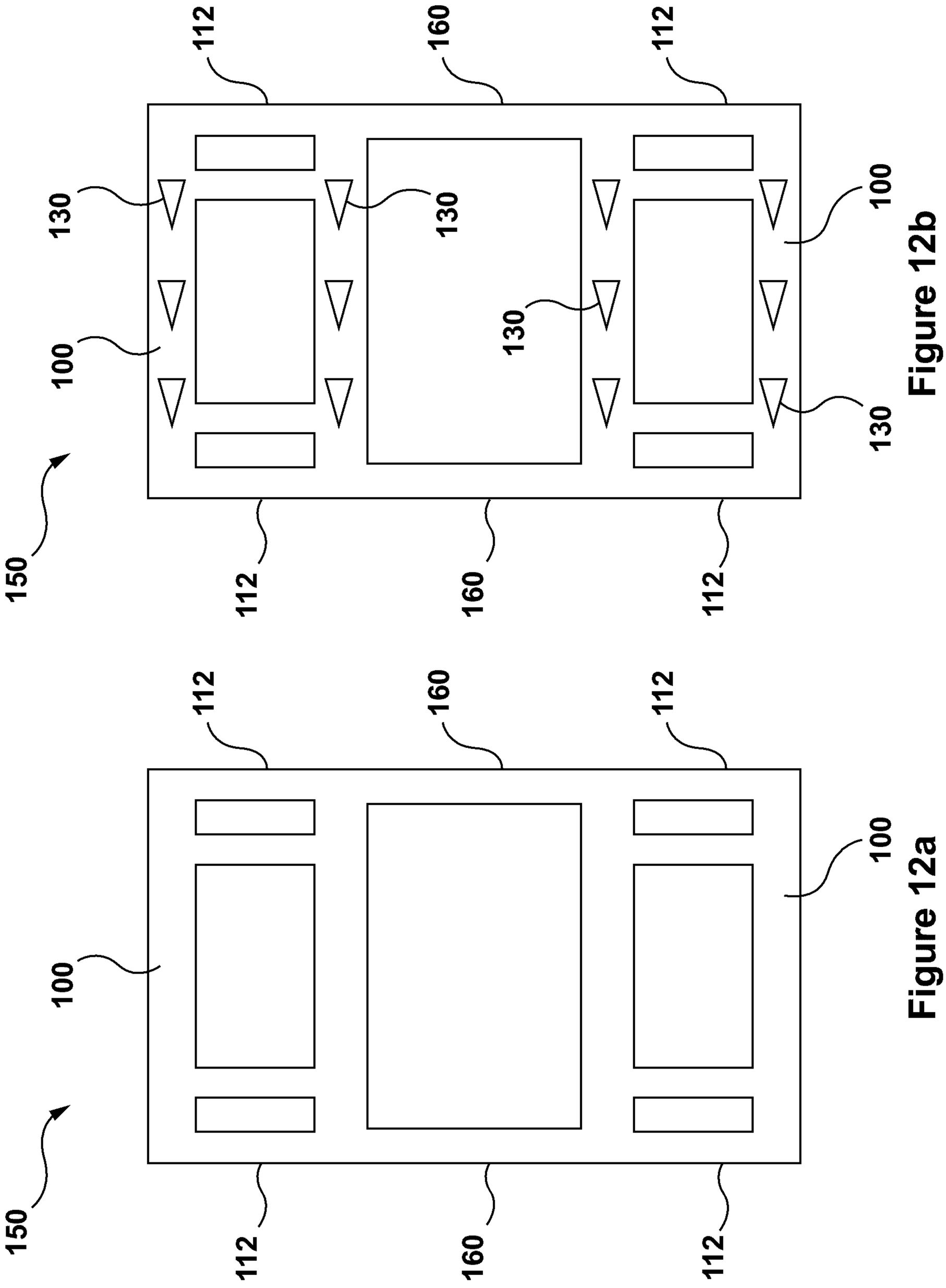


Figure 12b

Figure 12a

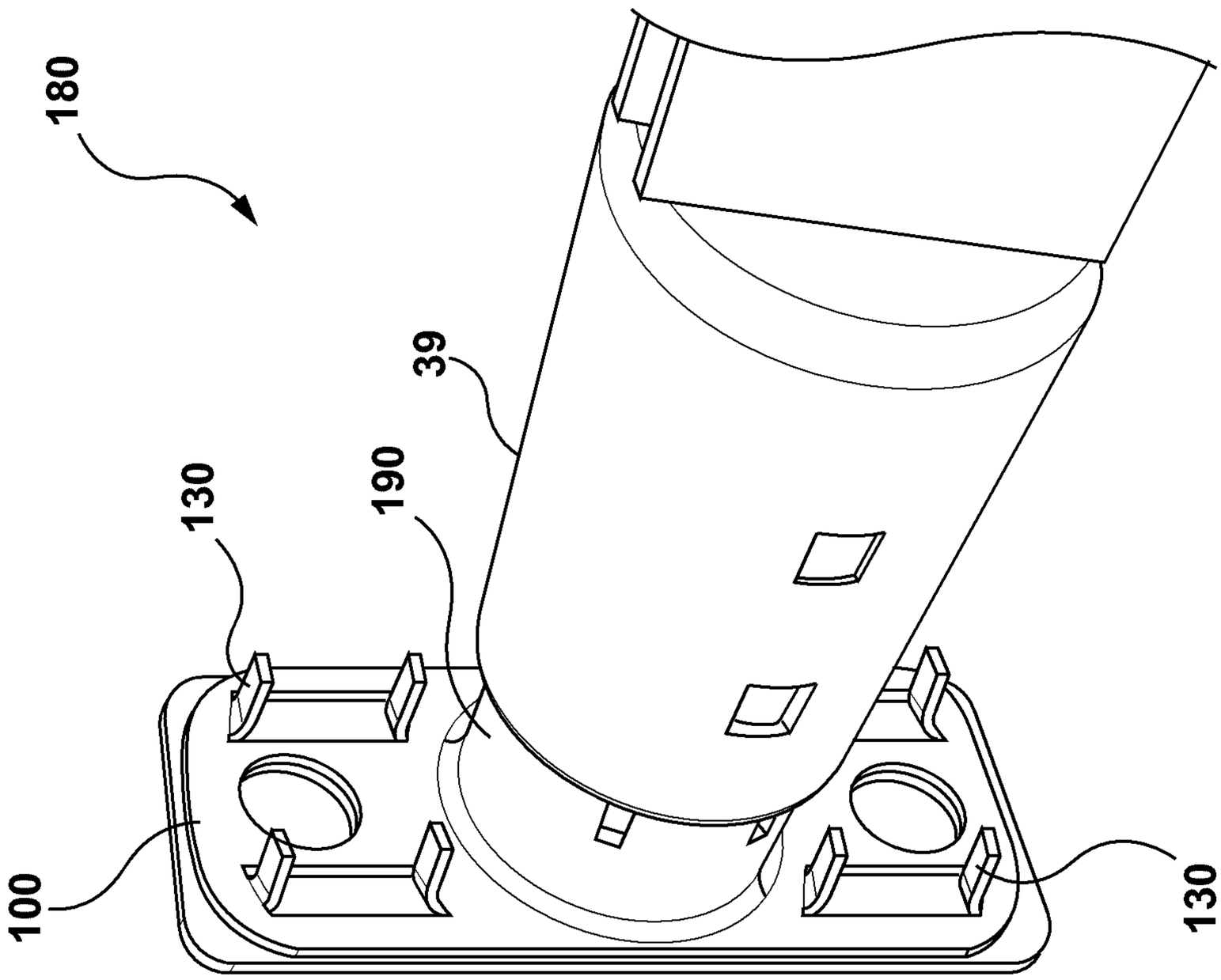


Figure 13b

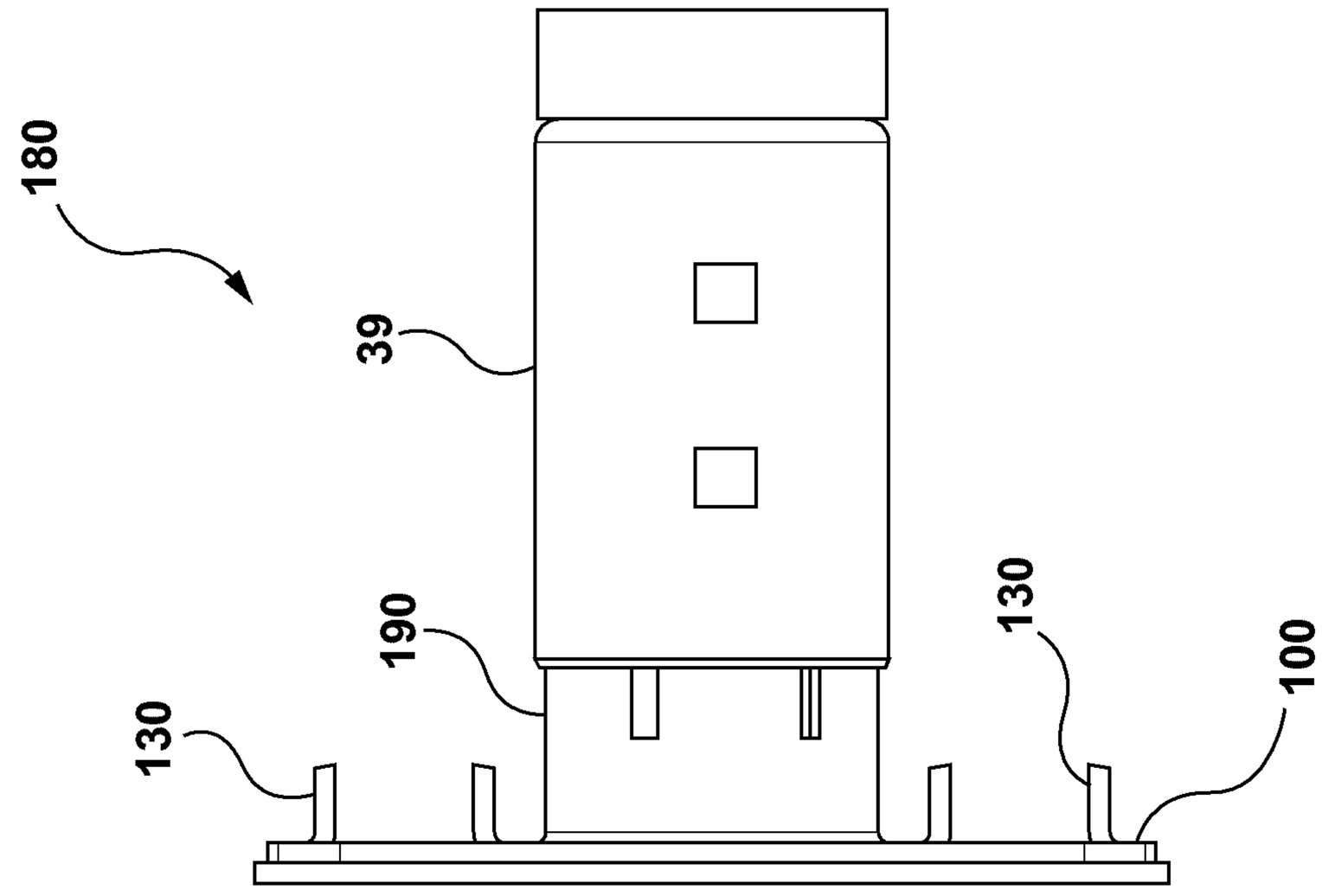


Figure 13a

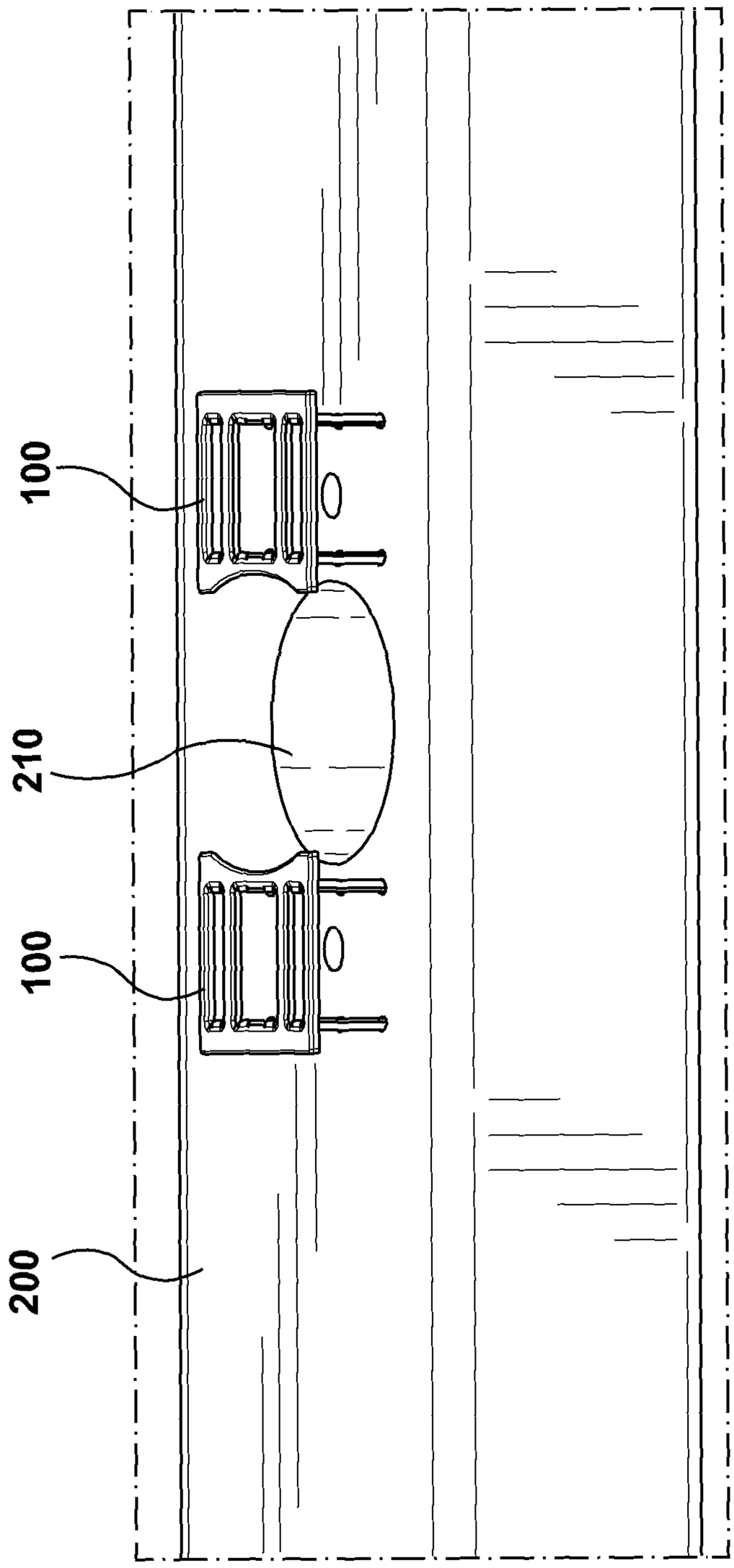


Figure 14

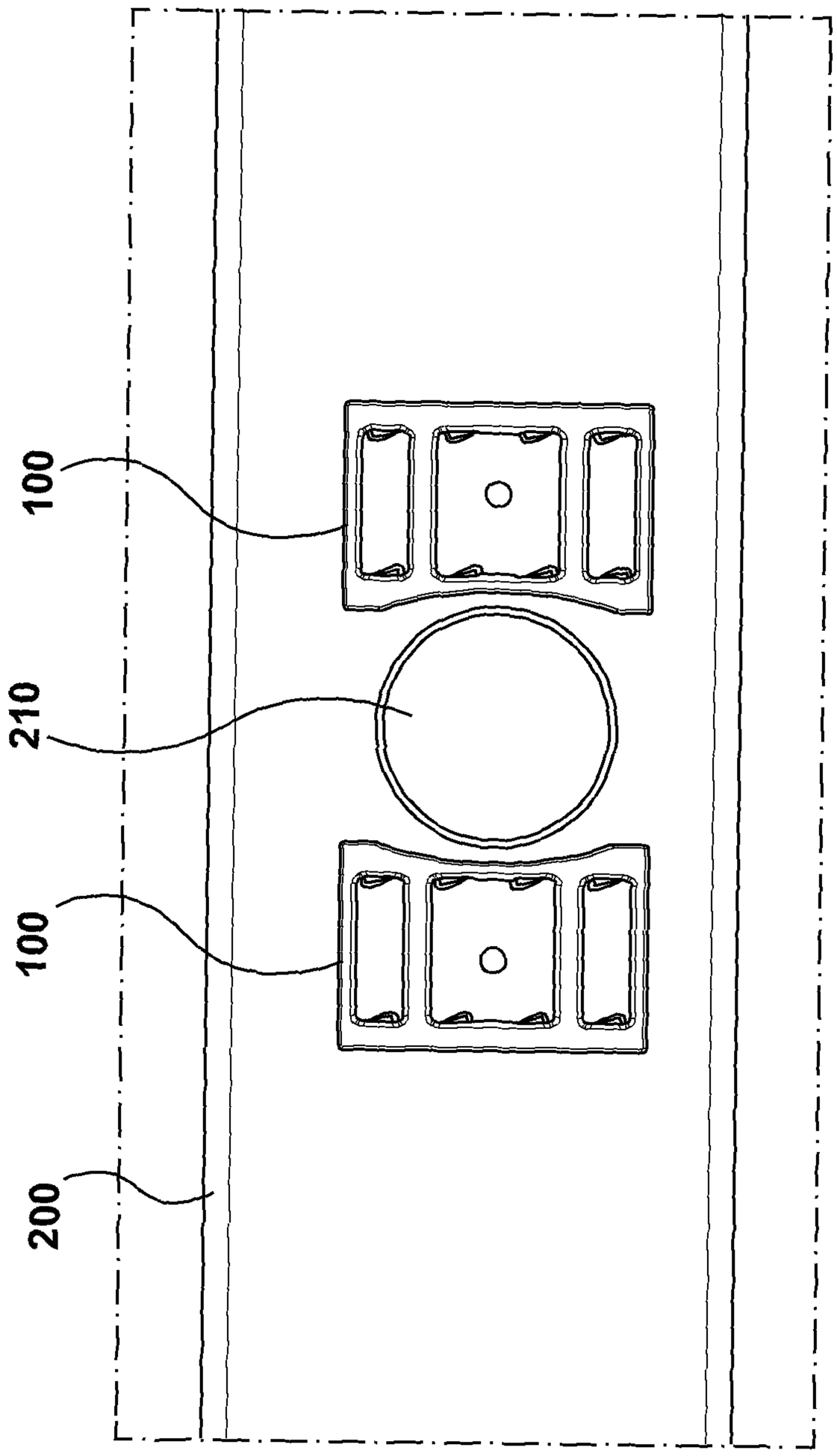


Figure 15

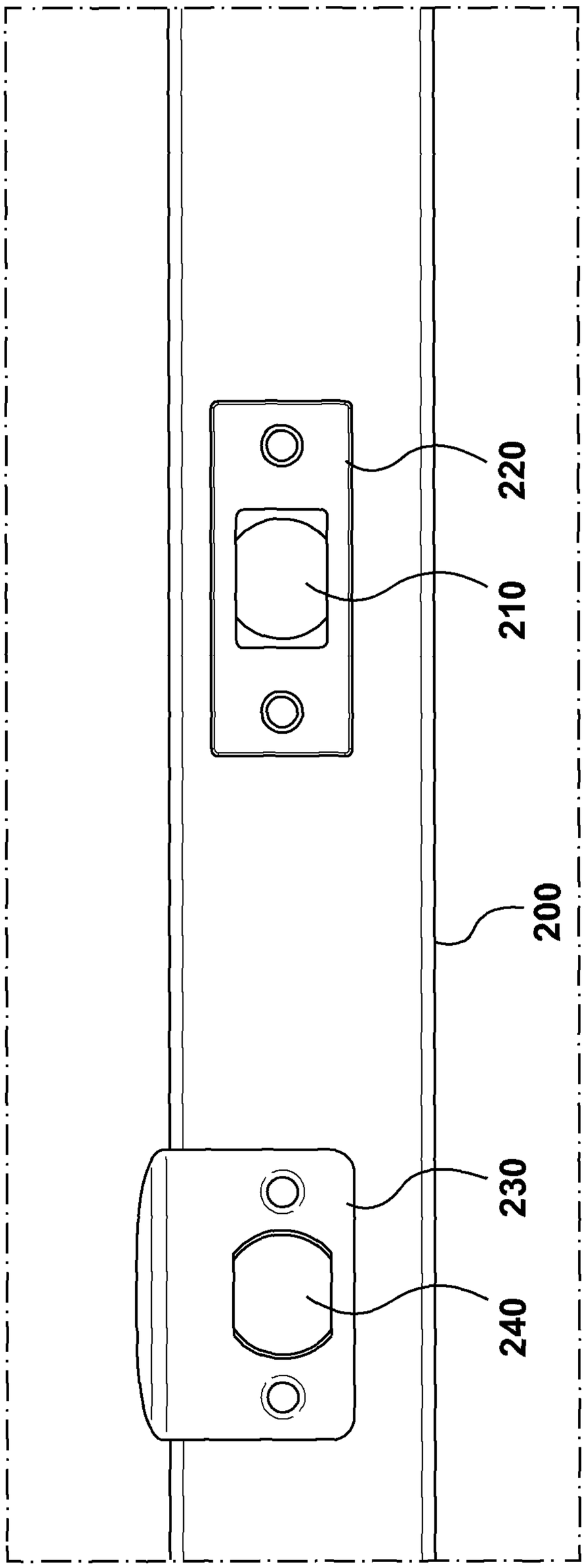
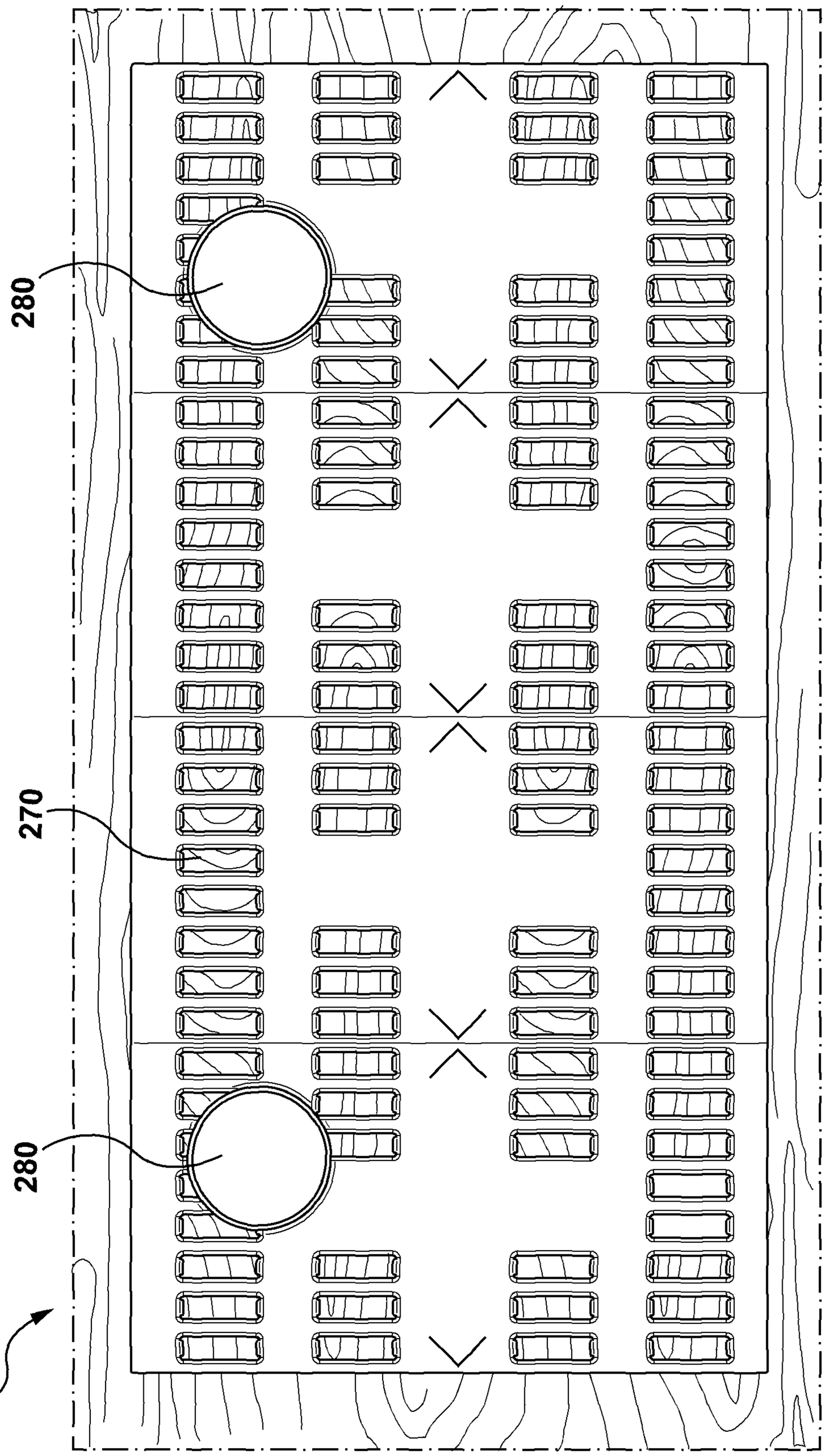


Figure 16



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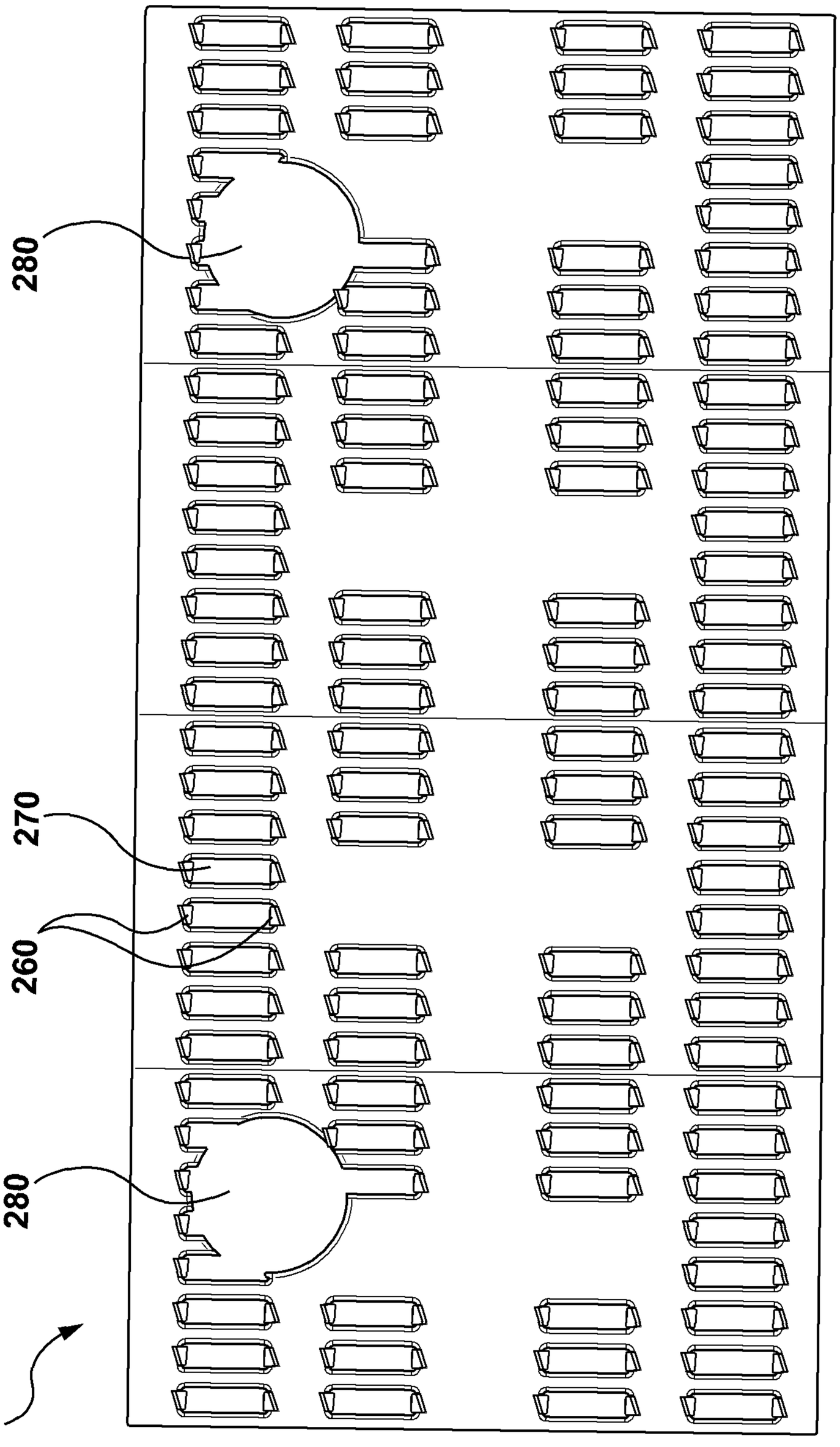

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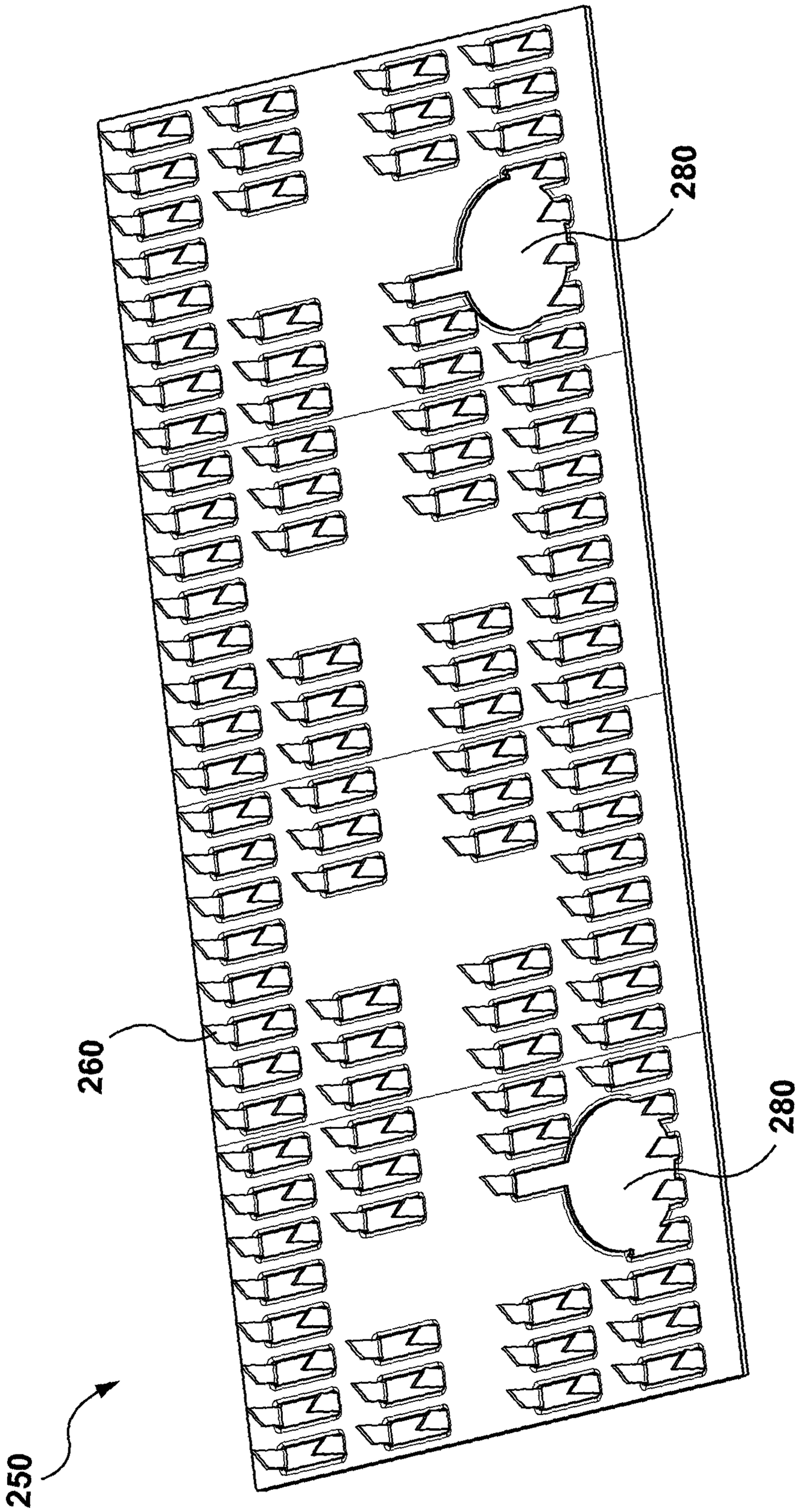
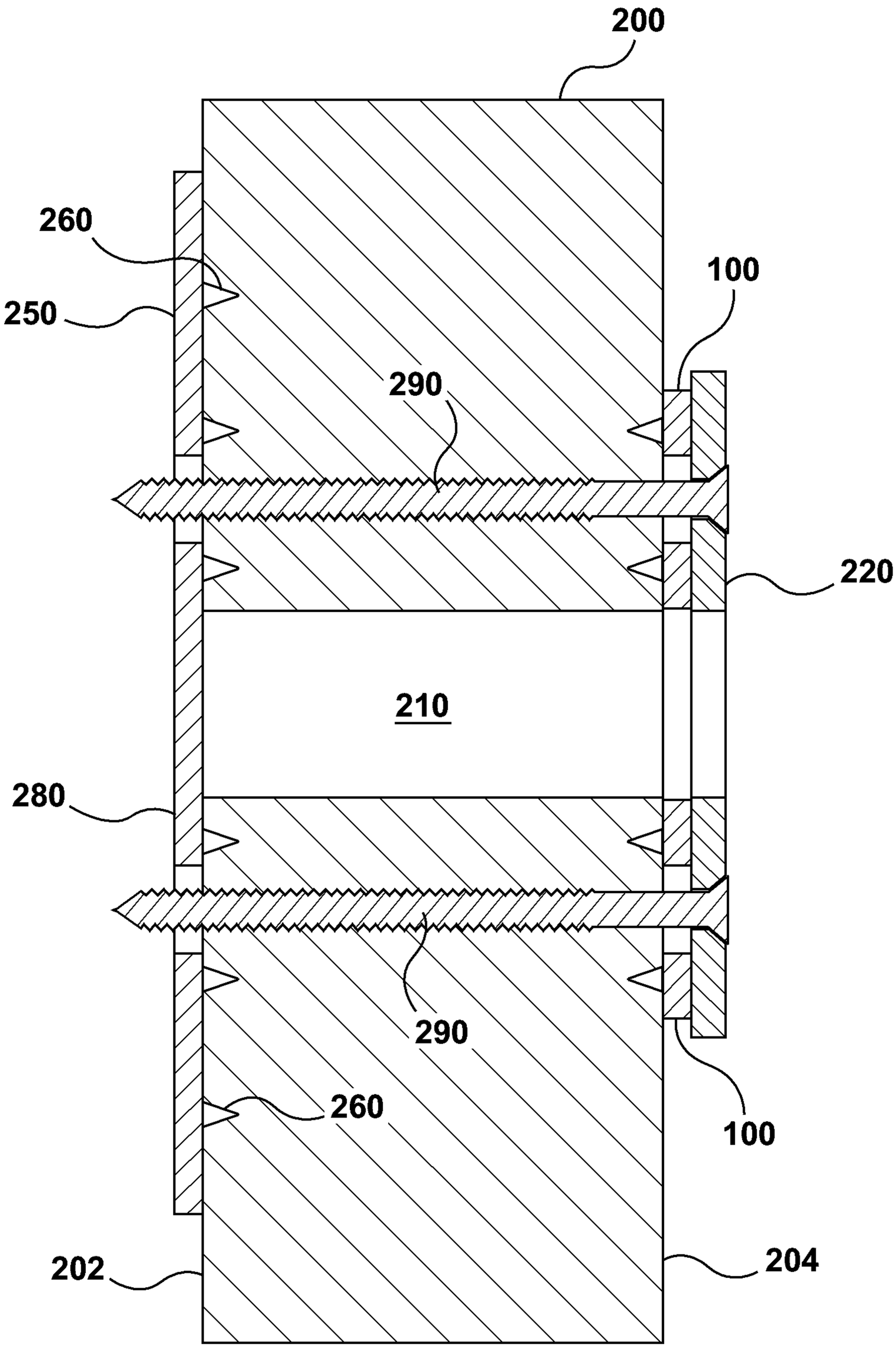


Figure 19



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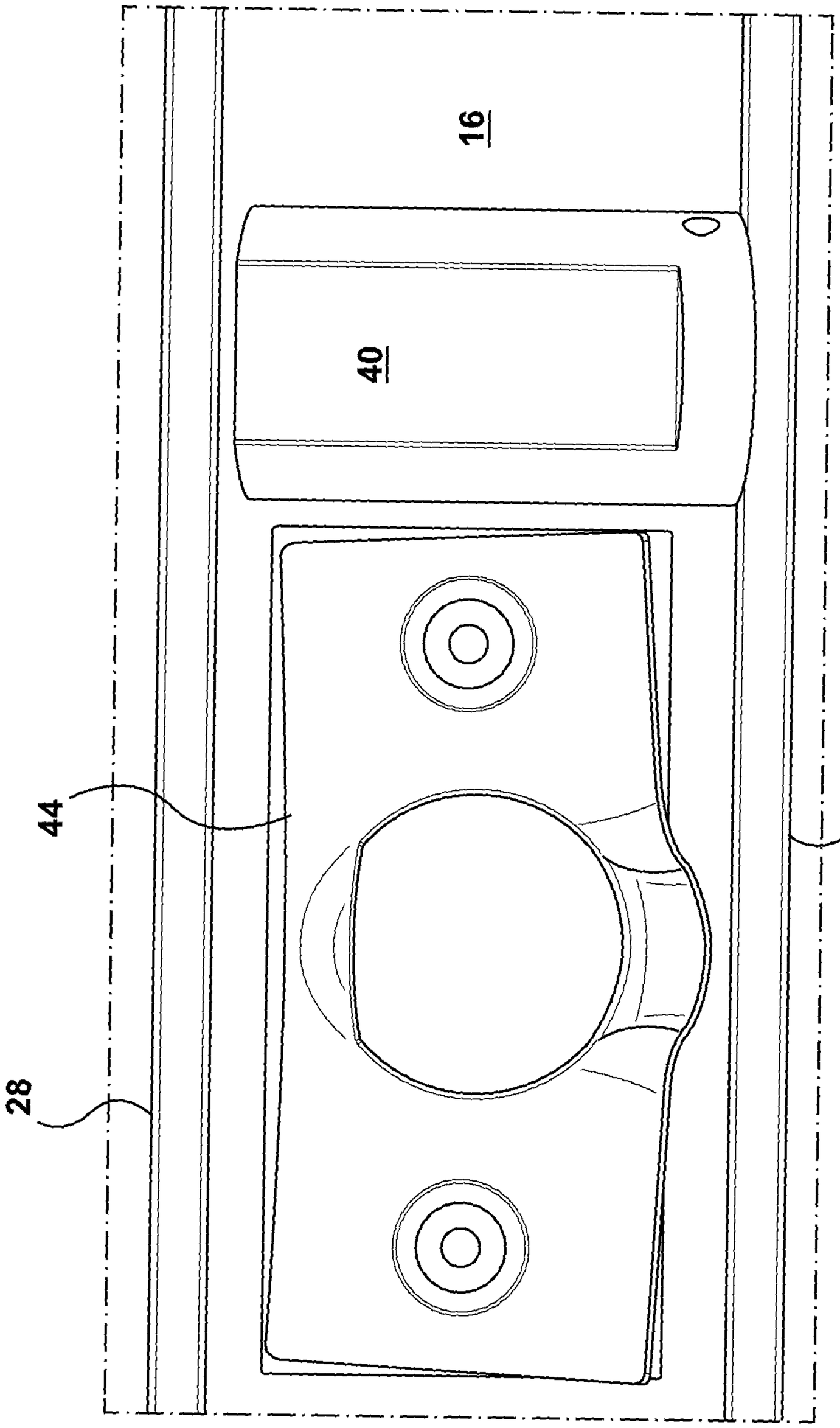

Figure 21

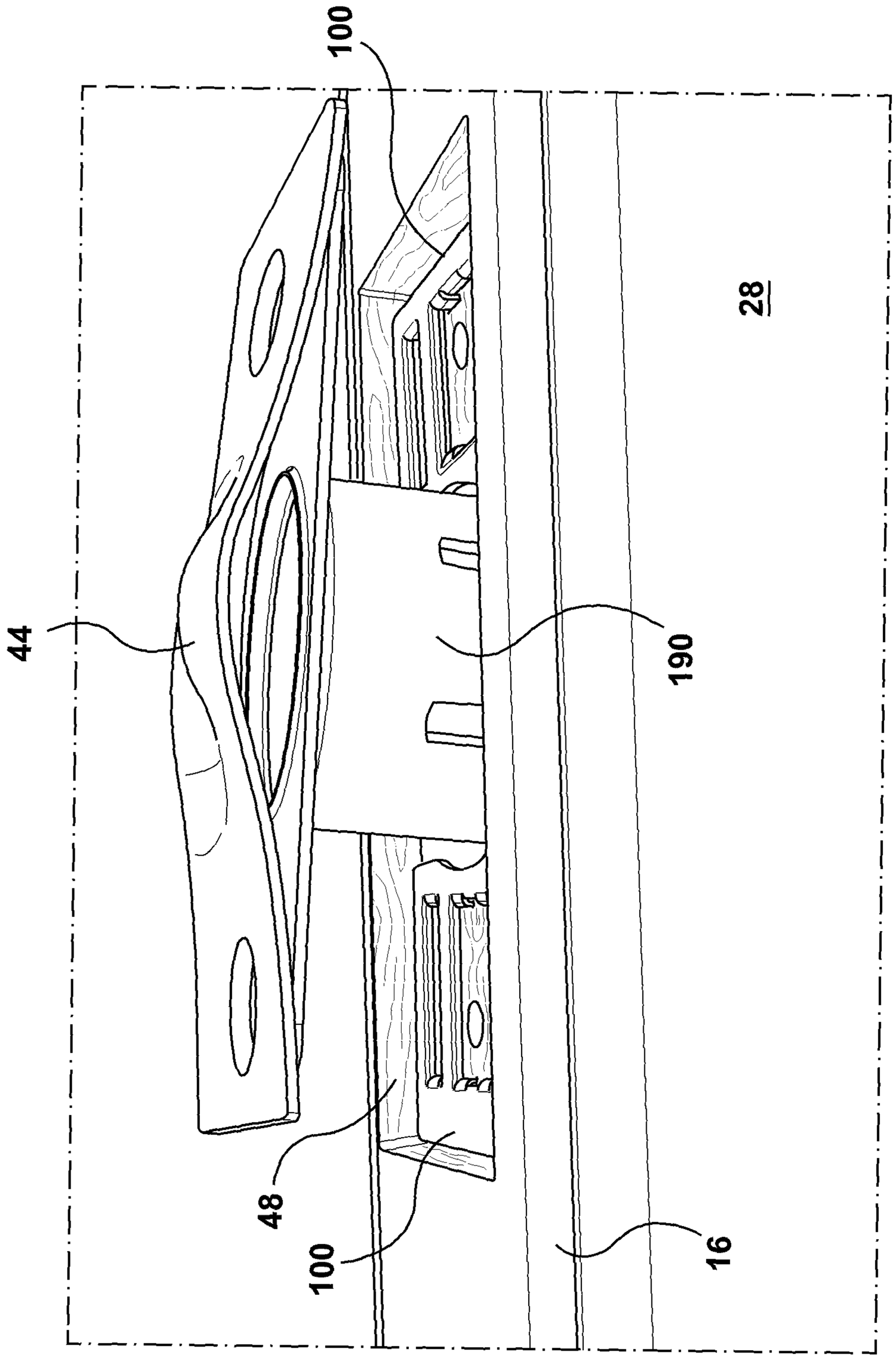

Figure 22

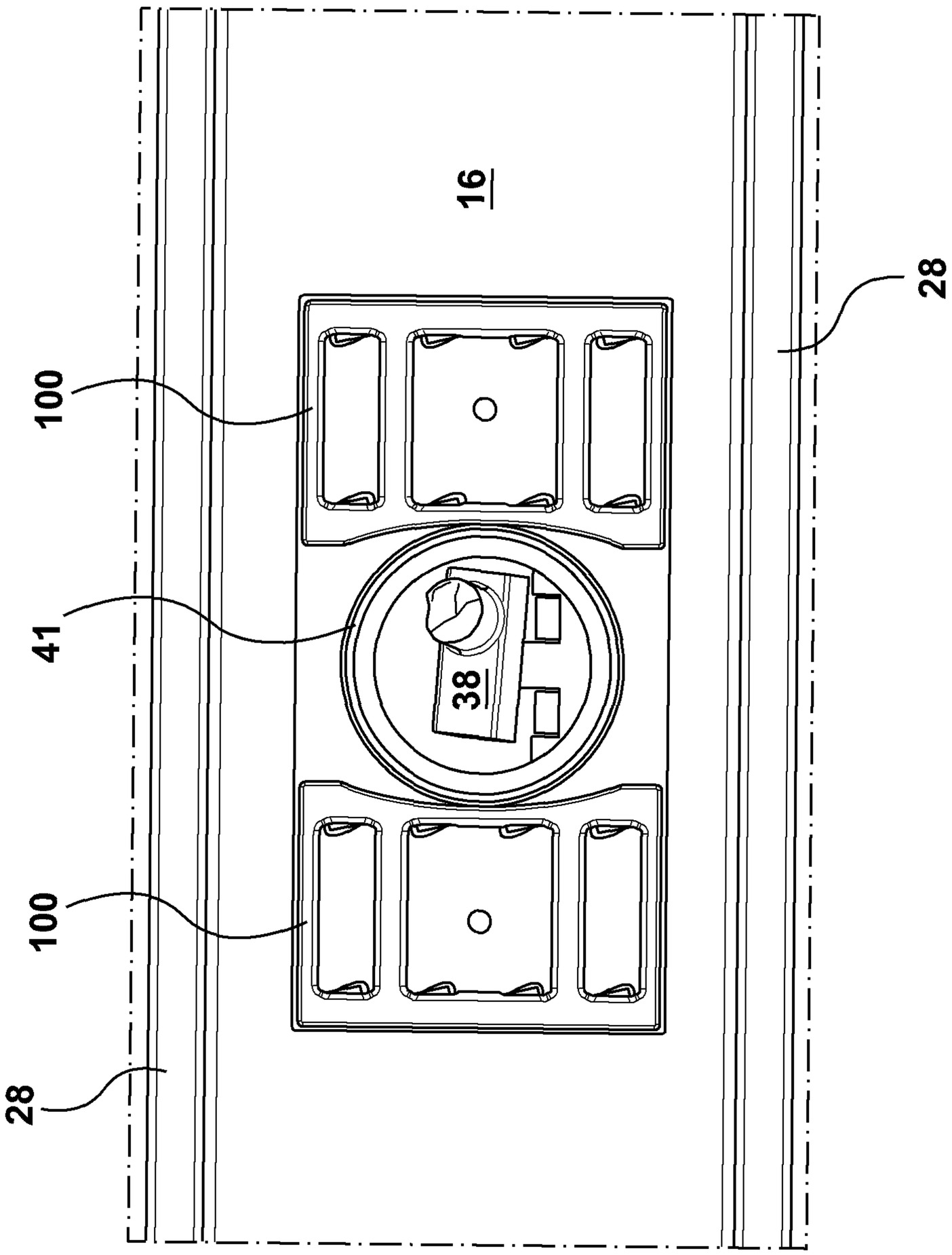

Figure 23

REINFORCEMENT MEMBER FOR A DOOR, DOOR REINFORCEMENT SET, DOOR REINFORCEMENT DEVICE, DOOR FRAME REINFORCEMENT KIT AND DOOR SECURITY KIT

CROSS-REFERENCE

The present application claims priority from U.S. Provisional Patent Application Ser. No. 63/167,962, filed on Mar. 30, 2021, the disclosure of which is incorporated by reference herein in its entirety.

TECHNICAL FIELD

The present disclosure relates to the field of home security. More specifically, the present disclosure relates to a reinforcement member for a door, a door reinforcement set, a door reinforcement device, a door frame reinforcement kit and a door security kit.

BACKGROUND

Laminated doors, for example steels doors, are very popular due to their excellent energetic performance and good looks, and are generally perceived as being very safe and able to resist brute impacts. This perception may deceive the consumer and it is in fact fairly easy for burglars to break into houses by defeating laminated doors. FIG. **1** (Prior Art) illustrates a typical laminated door structure. FIG. **1** is not to scale. A door **10** has a perimetral wooden frame, usually made of pine, that includes a top rail **12** a bottom rail **14** extending horizontally, a pair of opposed door stiles **16** and **18** extending vertically, and insulation material **20** enclosed within the perimetral frame. One or more optional windows **22** may take some of the space occupied by the insulation material **20**. Hinges (not shown) are mounted on the door stile **18** (called a hinge stile) for installation of the door **10** in a frame (not shown). The door stile **16** called a lock stile) may be reinforced by a wooden block **24**, also usually made of pine, in which a cylinder opening **26** is provided for installation of a door lock. If there is no wooden block **24**, the cylinder opening **26** is formed through the insulation material **20**. The shown structure is cover on both faces by aesthetically pleasing surfaces, such as steel or fiberglass sheets (also called door skin), steel being the most common material used in the construction of laminated doors. Steel sheets **28** are not shown on FIG. **1**, but are visible on later Figures.

One of the most commonly used type of locks securing doors in residential and commercial applications is the deadbolt lock. FIG. **2** (Prior Art) is an exploded view of a deadbolt lock **30**. A cylinder **32** is received in the cylinder opening **26** of the door **10** and within inside and outside cylinder housings **34** that are mounted on opposite faces of the door **10**. A bolt extension **38**, a casing **39** and a deadbolt **40** are received in a bolt opening **42** (FIG. **3**) formed in the door stile **16** and in the wooden block **24** of the door **10**. The cylinder **32** is actuated by a key **36** (FIG. **4**) and acts upon a cam of the bolt extension **38** such that action of the key **36** on the cam causes the deadbolt **40** to move between its retracted (unlocked) and extended (locked) positions in the casing **39** and in the bolt opening **42**. A faceplate **44** is configured to be mounted on the door stile **16** using screws **47** inserted in the door stile **16** via screw openings **45** of the faceplate **44**. The faceplate **44** has a central opening matching a size and shape of the bolt opening **42** formed in the door stile **16** and guides movements of the deadbolt **40** between its locked and unlocked positions. The deadbolt **40**, when in its extended position, penetrates into a bolt opening of a door frame **46** (FIG. **4**). Other details of the construction of the deadbolt lock **30** are not provided herein, as they are known to the skilled reader.

FIG. **3** (Prior Art) shows openings formed in the door **10** of FIG. **1** for installation of the deadbolt lock **30**. The bolt opening **42** is formed in the door stile **16** and in the insulation material **20** (there is no wooden block **24** in the example of FIG. **3**). The bolt opening **42** is perpendicular to the cylinder opening **26** and is arranged for the deadbolt **40** to move between the unlocked and locked position. A mortise **48** is formed on an outer surface of the door stile **16**. The mortise **48** surrounds the bolt opening **42** and is shaped for receiving the faceplate **44**. The steel sheets **28** (or etc. sheets) mounted on both faces of the door **10** are thin and modestly contribute to the structural integrity of the door **10**.

FIG. **4** (Prior Art) shows a complete installation of the door **10**, the deadbolt lock **30** and the door frame **46**. The door frame **46** is not installed in an opening on a wall in order to illustrate the position of the deadbolt **40**, which is in its extended (locked) position. The example of FIG. **4** shows that the door frame **46** includes metal (e.g. steel or aluminum) subframe **46**A. However most typical installations include door frames **46** that are entirely made of wood.

It is difficult to defeat a deadbolt lock **30** by so-called "jimmying" action. However, most doors **10** with deadbolt locks **30** can be opened by exerting on such door **10** a brute force sufficient to break the perimetral wooden frame of the door **10** in the bolt opening area. FIGS. **5** and **6** (Prior Art) illustrate damage that may result from moderate impacts on the door **10**. On FIG. **5**, following the application of an impact on the door **10**, the door stile **16** has cracked and the deadbolt **40** is now in an offset position from an axis of the bolt opening **42**. As shown on FIG. **6**, the door may have been opened by application of an additional impact. Of course, a single impact might lead to the same result as shown on FIG. **6**, provided that this single impact is sufficiently strong. One or a few impacts may have resulted from application of brute force of a magnitude that one person may impose of the door **10**, using that person's own weight or using a blunt object. On FIG. **6**, the deadbolt lock **30** has been removed from the door **10** after application of the impacts in order to better illustrate the damage to the door **10**. At the time of the impacts, the deadbolt **40** was extending from the wooden block **24** and the door stile **16**, through the faceplate **44** and into the door frame **46**. Nothing else than the deadbolt **40** was maintaining the door **10** in the locked position. Consequently, the force of the impact was transferred to the deadbolt and further to the wooden block **24**, the door stile **16** and the steel sheets **28**. The door stile **16** and the wooden block **24** cracked open as a consequence of the impact, and the steel sheets **28** were somewhat distorted. The damage to the door **10** was such that the deadbolt **40** was no longer reaching the door frame **46** and the door **10** was opened, without retraction of the deadbolt **40** from its extended position. In the particular example of FIG. **5**, the metal subframe **46**A of the door frame **46** suffered some distortion. Most doors are mounted in wooden door frames that may withstand similar damages as do the doors themselves.

Despite their popularity and general use, laminated doors such as steel or fiberglass doors have continuously failed to provide the level of home security that the consumers expect.

Therefore, there is a need for improvements that compensate for problems related to the weaknesses of laminated doors and of related door frames.

SUMMARY

In a first aspect, various implementations of the present technology provide a reinforcement member fora door, comprising: a plate; and a plurality of hooks extending on one face of the plate the reinforcement member being shaped for mounting on a door stile on one side of a locking member opening formed on the door stile and for being maintained on the door stile by insertion of the hooks in a material of the door stile, a width of the plate being configured for allowing the plate to be contained within a width of the door stile.

In some implementations of the present technology, the plate has a generally rectangular perimeter.

In some implementations of the present technology, the reinforcement member further comprises one or more barbs formed on one or more of the hooks.

In some implementations of the present technology, the plate includes an internal opening within the generally rectangular perimeter.

In some implementations of the present technology, the hooks are neighbors to the internal opening.

In some implementations of the present technology, the hooks are distributed on two rows on both sides of the internal opening.

In some implementations of the present technology, the plate further comprises additional openings adjacent to the internal opening; and the hooks are formed by cutting and bending material of the plate for forming the internal opening and the additional openings.

In some implementations of the present technology, the generally rectangular perimeter of the plate includes two opposite short sides and two opposite long sides perpendicular to the short sides, the long sides defining the width of the plate; and one of the long sides includes an indentation adapted for allowing movement of a locking member when the reinforcement member is mounted on the door stile.

In some implementations of the present technology, the hooks are distributed along each of the two opposite long sides.

In a second aspect, various implementations of the present technology provide a door reinforcement set, comprising: two reinforcement members; the two reinforcement members being configured to allow mounting a first of the two reinforcement members on a first side of the locking member opening formed on the door stile and to allow mounting a second of the two reinforcement members on a second side of the locking member opening opposite from the first side of the locking member opening; and the door reinforcement set being configured for allowing the two reinforcement members to be contained within the width of the door stile when the two reinforcement members are mounted on the door stile.

In some implementations of the present technology, the two reinforcement members are sized and configured for allowing an outer perimeter formed by the two reinforcement members to be contained within a perimeter of a faceplate mountable on the door stile after mounting of the two reinforcement members on the door stile, the faceplate having an opening adapted to allow passage of a locking member; and the two reinforcement members are sized and configured so that the internal openings of the two reinforcement members allow passage of screws for mounting the faceplate on the door stile after mounting of the two reinforcement members on the door stile.

In a third aspect, various implementations of the present technology provide a door reinforcement device, comprising: two reinforcement members; the two reinforcement members being fixedly connected by a pair of bridges extending from lateral edges of the two reinforcement members so that the two reinforcement members and the pair of bridges form a unitary piece configured for encircling the locking member opening when the door reinforcement device is mounted on the door stile.

In a fourth aspect, various implementations of the present technology provide a door reinforcement device, comprising: two reinforcement members; the two reinforcement members being integrated in a faceplate mountable on the door stile, the faceplate having an opening adapted to allow passage of a locking member; and the internal openings of the two reinforcement members being positioned to allow passage of screws for mounting the door reinforcement device on the door stile.

In a fifth aspect, various implementations of the present technology provide a door reinforcement device, comprising: two reinforcement members; the two reinforcement members are integrated in a deadbolt guide insertable in the locking member opening formed on the door stile.

In some implementations of the present technology, the two reinforcement members and the deadbolt guide are further integrated with a faceplate mountable on the door stile, the faceplate having an opening adapted to allow passage of a locking member.

In a sixth aspect, various implementations of the present technology provide a reinforcement member fora door, comprising: a plate; and a plurality of hooks extending on one face of the plate; the reinforcement member being shaped for mounting on a strike jamb of a door frame on one side of a locking member opening formed on the strike jamb and for being maintained on the strike jamb by insertion of the hooks in a material of the door frame.

In some implementations of the present technology, the plate has a generally rectangular perimeter.

In some implementations of the present technology, the plate includes an internal opening within the generally rectangular perimeter.

In some implementations of the present technology, the reinforcement member further comprises one or more barbs formed on one or more of the hooks.

In some implementations of the present technology, the hooks are neighbors to the internal opening.

In some implementations of the present technology, the hooks are distributed on two rows on both sides of the internal opening.

In some implementations of the present technology, the plate further comprises additional openings adjacent to the internal opening; and the hooks are formed by cutting and bending material of the plate for forming the internal opening and the additional openings.

In some implementations of the present technology, the generally rectangular perimeter of the plate includes two opposite short sides and two opposite long sides perpendicular to the short sides, the long sides defining the width of the plate; and one of the long sides includes an indentation adapted for allowing movement of a locking member when the reinforcement member is mounted on the door stile.

In some implementations of the present technology, the hooks are distributed along each of the two opposite long sides.

In a seventh aspect, various implementations of the present technology provide a door reinforcement set, comprising: two reinforcement members; the two reinforcement members being configured to allow mounting a first of the two reinforcement members on a first side of the locking member opening formed on the strike jamb and to allow mounting a second of the two reinforcement members on a second side of the locking member opening opposite from the first side of the locking member opening.

In some implementations of the present technology, the two reinforcement members are sized and configured so that a perimeter of the door reinforcement set comprising the two reinforcement members does not extend beyond a perimeter of a strike plate mountable on the strike jamb after mounting of the two reinforcement members on the strike jamb, the strike plate having an opening adapted to allow passage of a locking member; and the two reinforcement members are sized and configured so that the internal openings of the two reinforcement members are positioned to allow passage of screws for mounting the strike plate on the strike jamb after mounting of the two reinforcement members.

In an eighth aspect, various implementations of the present technology provide a door reinforcement device, comprising: two reinforcement members; the two reinforcement members being fixedly connected by a pair of bridges extending from lateral edges of the two reinforcement members so that the two reinforcement members and the pair of bridges form a unitary piece configured for encircling the locking member opening when the two reinforcement members are mounted on the strike jamb.

In a ninth aspect, various implementations of the present technology provide a door reinforcement device, comprising: two reinforcement members; the two reinforcement members being integrated in a strike plate mountable on the strike jamb, the strike plate having an opening adapted to allow passage of a locking member; and the internal openings of the two reinforcement members being positioned to allow passage of screws for mounting the door reinforcement device.

In a tenth aspect, various implementations of the present technology provide a door frame reinforcement kit, comprising: a back plate having a first substantially flat surface and a second surface having a plurality of projections adapted for insertion in a material of a door frame; and the door reinforcement set; the kit being configured to allow: positioning the back plate on a back face of the strike jamb, mounting the reinforcement members of the door reinforcement set on the strike jamb, positioning a strike plate over the reinforcement members, inserting screws through screw openings of the strike plate, through the internal opening of each of the two reinforcement members and through the material of the door frame so that the screws pass through the back plate to maintain the door frame reinforcement kit in place on the door frame.

In some implementations of the present technology, the door frame reinforcement kit further comprises the strike plate.

In an eleventh aspect, various implementations of the present technology provide a door frame reinforcement kit, comprising: a back plate having a first substantially flat surface and a second surface having a plurality of projections adapted for insertion in a material of a door frame; and the door reinforcement device; the kit being configured to allow: positioning the back plate on a back face of the strike jamb, mounting the door reinforcement device on the strike jamb, positioning a strike plate over the door reinforcement device, inserting screws through screw openings of the strike plate, through the internal opening of each of the two reinforcement members and through the material of the door frame so that the screws pass through the back plate to maintain the door frame reinforcement kit in place on the door frame.

In some implementations of the present technology, the door frame reinforcement kit, further comprises the strike plate.

In a twelfth aspect, various implementations of the present technology provide a door frame reinforcement kit, comprising: a back plate having a first substantially flat surface and a second surface having a plurality of projections adapted for insertion in a material of a door frame; and the door reinforcement device; the kit being configured to allow: positioning the back plate on a back face of the strike jamb, mounting the door reinforcement device on the strike jamb, inserting screws through screw openings of the door reinforcement device and through the material of the door frame so that the screws pass through the back plate to maintain the door frame reinforcement kit in place on the door frame.

In a thirteenth aspect, various implementations of the present technology provide a door security kit, comprising: the door reinforcement set; and the door frame reinforcement kit.

In some implementations of the present technology, the door frame reinforcement kit further comprises one or more barbs formed on one or more of the projections

In a fourteenth aspect, various implementations of the present technology provide a door security kit, comprising: the door reinforcement device; and the door frame reinforcement kit.

The foregoing and other features will become more apparent upon reading of the following non-restrictive description of illustrative embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the disclosure will be described by way of example only with reference to the accompanying drawings, in which:

FIG. **1** (Prior Art) illustrates a typical laminated door structure;

FIG. **2** (Prior Art) is an exploded view of a deadbolt lock;

FIG. **3** (Prior Art) shows openings formed in the door of FIG. **1** for installation of the deadbolt lock;

FIG. **4** (Prior Art) shows a complete installation of the door **10**, the deadbolt lock **30** and the door frame **46**;

FIGS. **5** and **6** (Prior Art) illustrate damage that may result from moderate impacts on the door;

FIG. **7** is a top perspective view of a reinforcement member according to an embodiment;

FIG. **8***a* is a bottom perspective view of the reinforcement member according to an embodiment;

FIG. **8***b* is a detailed, side elevation partial view of the reinforcement member showing the addition of a barb on a hooks according to an embodiment;

FIG. **8***c* is a perspective view of a U-shaped reinforcement member according to an embodiment;

FIG. **9** shows a set including a pair of reinforcement members mounted in a mortise formed on a door stile according to an embodiment;

FIG. **10** shows a set including a pair of reinforcement members directly mounted on a door stile according to an embodiment according to an embodiment;

FIG. **11** is a bottom plan view of a pair of reinforcement members and of a faceplate according to an embodiment;

FIGS. **12***a* and **12***b* are respectively top and bottom plan views of a door reinforcement device integrating a pair of reinforcement members according to an embodiment;

FIGS. **13***a* and **13***b* are respectively side elevation and perspective views of a door reinforcement device integrating a pair of reinforcement members and a deadbolt guide insertable in a bolt opening formed on a door stile according to an embodiment;

FIG. **14** shows a set including a pair of reinforcement members ready to be mounted on a strike jamb of a door frame according to an embodiment;

FIG. **15** shows a set including a pair of reinforcement members mounted on the strike jamb of the door frame according to an embodiment;

FIG. **16** shows a strike plate and a latch plate mounted on the strike jamb of the door frame over pairs of reinforcement members according to an embodiment;

FIG. **17** is a first side view of a back plate according to an embodiment;

FIG. **18** is a second side view of the back plate showing a plurality of hooks according to an embodiment;

FIG. **19** is a perspective view of the back plate according to an embodiment;

FIG. **20** is a cross-sectional side view of a door frame reinforcement kit mounted on a strike jamb according to an embodiment;

FIG. **21** is a front view of the door stile, of the faceplate and of the deadbolt after impact on the door, the door stile being reinforced by the addition of a pair of reinforcement members;

FIG. **22** is a side view of the door stile, of the faceplate and of a deadbolt guide and of the pair of reinforcement members after impact on the door; and

FIG. **23** is a front view of the pair of reinforcement members on the door stile after impact on the door.

Like numerals represent like features on the various drawings. The various Figures are not to scale.

DETAILED DESCRIPTION

Various aspects of the present disclosure generally address one or more of the problems related to the weaknesses of laminated doors and of related door frames.

A door stile, or a door frame, or both, are reinforced by the insertion of one or two reinforcement members in proximity to a locking member opening, for example a bolt opening or a door latch opening, formed in the door stile or in a strike jamb of the doorframe. Each reinforcement member comprises a plate having a plurality of hooks extending from one face of the plaque. One reinforcement member may be mounted on one side of the locking member opening and another reinforcement member may be mounted on an opposite side of the locking member opening. Surprisingly, the plate and the hooks inserted in the material (for example pine or another type of wood) of the door stile or of the door frame provide a very significant reinforcement of the material. As a result, a door having one or more reinforcement members mounted on its door stile and/or on its door frame becomes able to resist to much stronger impacts when compared to the same door without such reinforcement members.

FIG. **7** is a top perspective view of a reinforcement member **100**. FIG. **8***a* is a bottom perspective view of the reinforcement member **100**. The reinforcement member **100** comprises a plate **110** having a generally rectangular perimeter and an internal opening **120**. Additional openings **122** may or may not be formed in the plate **110** in various embodiments. A plurality of hooks **130** extend on one face of the plate **110**. A minimum of two hooks **130** may be extend from the plate **110**. In an embodiment, the hooks **130** are formed by cutting and bending the material of the plate **110** when forming the internal opening **120** and the additional openings **122** so that, as a result, the hooks **130** are neighbors to the internal opening **120** and to the additional openings **122**. The reinforcement member **100** is shaped for mounting on the door stile **16** on one side of a locking member opening, such as the bolt opening **42** or a door latch opening, formed on the door stile **16** and for being maintained on the door stile **16** by insertion of the hooks **130** in a material of the door stile **16**. Without limitation, the reinforcement member **100** may be hammered in plate in the on the door stile **16**, without requiring any preparation other than the customary drilling of the cylinder opening **26** and of the bolt opening **42** or door latch opening, and the customary forming of the mortise **48**. A width of the plate **110** is configured for allowing the plate **110** to be contained within a width of the door stile **16**.

The generally rectangular perimeter of the plate **110** is defined by two opposite short sides **112** and two opposite long sides **114** substantially perpendicular to the short sides **112**. Although corners at junctions of the short sides **112** and long sides **114** as shown are squared, such corners may be rounded in some embodiments. The long sides **114** define the width of the plate **110**. As shown, one of the long sides **114** includes an optional indentation **116** adapted for positioning the reinforcement member **100** close of the bolt opening **42** while allowing movement of a locking member, such as the deadbolt **40** or a door latch (not shown), when the reinforcement member **100** is mounted on the door stile. Embodiments of the reinforcement member **100** without the indentation **116** are also contemplated. In the shown embodiment, the hooks **130** are neighbors to the internal opening **120**, the hooks **130** being distributed along each of the two opposite long sides **114**, on both sides of the internal opening **120**.

FIG. **8***b* is a detailed, side elevation partial view of the reinforcement member showing the addition of a barb on a hook according to an embodiment. In the embodiment of FIG. **8***b*, an optional barb **131** is formed on a hook **130**. This barb **131** is akin to a "reverse hook" having a tip that points substantially in a direction that is opposite to a direction of a tip of the hook **130**. Once the reinforcement member **100** is mounted on the door stile **16**, the barb **131** may act to oppose any force that could attempt to pull the reinforcement member **100** away from the door stile **16**. It is contemplated that one or more barbs **131** may be formed on one or more of the hooks **130**.

FIG. **8***c* is a perspective view of a U-shaped reinforcement member according to an embodiment. In the U-shaped reinforcement member **100***a*, the plate **110** is bent at both extremities to form a pair of wide hooks **130***a*. Preforming of corresponding grooves (not shown) within the mortise **48** formed on the door stile **16** may facilitate mounting of this version of the reinforcement member **100***a* on the door stile **16**. It is contemplated that one or more barbs similar to the barbs **131** may be formed on the hooks **130***a* of the U-shaped reinforcement member **100***a*.

Variations of the reinforcement member are contemplated. For example and without limitation, in an embodiment, a reinforcement member may consist of a single metal strip including at least two hooks near extremities of the metal strip. The plate of the reinforcement member may

have a triangular, round, oval or trapezoidal shape. In the same or other embodiments, a barb may be formed at the tip of each hook to prevent pulling out of the reinforcement member after insertion. The following examples will mainly refer to applications of the present reinforcement member **100** to reinforce a bolt opening **42** without limiting the use of the present reinforcement member **100** to reinforce other locking member openings, such as door latch openings.

Two reinforcement members **100** may be used in combination to become a door reinforcement set. FIG. **9** shows a set including a pair of reinforcement members **100** mounted in the mortise **48** formed on the door stile **16**. The two reinforcement members **100** allow mounting one reinforcement member **100** on a first side of the bolt opening **42** formed on the door stile **16** and mounting the other reinforcement member **100** on a second side of the bolt opening **42** opposite from the first side of the bolt opening **42**. The set formed of the two reinforcement members **100** may be installed while being contained within the width of the door stile **16** when the two reinforcement members **100** are mounted on the door stile **16**.

FIG. **9** shows that the door reinforcement set may be installed in the mortise **48** formed in the door stile **16**, the mortise **48** being also shaped for receiving the faceplate **44** (FIG. **2**) after mounting of the reinforcement members **100**. The two reinforcement members **100** may therefore be sized and configured to be fully contained underneath the faceplate **44**. Some door installations do not use the faceplate **44**, a cap (not shown) being mounted on the door stile **16** and fully covering the door stile **16**. FIG. **10** shows a set including a pair of reinforcement members **100** directly mounted on the door stile **16**. Forming of the mortise **48** is unnecessary in this configuration and the reinforcement members may be mounted on the surface of the door stile **16**. Forming the reinforcement members **100** without the internal openings **120** is contemplated for use in the configuration of FIG. **10** because there is no need to allow for using the screws **47** for installing the faceplate **44**. Mounting of extended reinforcement members covering a longer length of the door stile **16**, or mounting of a plurality of reinforcement members distributed along the length of the door stile **16** is also contemplated.

FIG. **11** is a bottom plan view of a pair of reinforcement members **100** and of the faceplate **44**. FIG. **11** is not to scale. A size and a configuration of the reinforcement members **100** allow an outer perimeter formed by the two reinforcement members **100** to be contained within a perimeter of the faceplate **44** when the faceplate **44** is mounted on the door stile **16** after mounting of the two reinforcement members **100** on the door stile **16**. The internal openings **120** of the reinforcement members **100** allow passage of screws (not shown) via screw openings **45** of the faceplate **44** for mounting the faceplate **44** on the door stile **16** after mounting of the two reinforcement members **100** on the door stile **16**. In an embodiment, the two reinforcement members **100** may be integrated in the faceplate **44** to form a door reinforcement device constructed as a unitary piece. A typical faceplate **44** may have 2.25 inch length and a 1.0 inch width. The mortise **48** typically has the same length and width. A typical bolt opening **42** may have a 0.875 inch diameter. In an embodiment, the long sides **114** of the reinforcement members **100** may be slightly shorter than 1.0 inch and the short sides **112** of the reinforcement members **100** may be about 0.625 inch (or about 0.725 inch the presence of the indentations **116**) so that the two reinforcement members **100** may be positioned within the mortise **48** and fully covered by the faceplate **44** without hindering the movement of the locking member when the assembly is complete. The number and the position of the hooks **130** may vary. In the shown embodiment (FIGS. **7**, **8** and **11**), each reinforcement member **100** includes eight hooks **130** forming two rows on either sides of the internal opening **120**, along the long sides **114**. This configuration maximizes a distance between the two rows of hooks and provides a good compromise between the amount of material (e.g. wood) of the door stile **16** between each hook **130**.

FIGS. **12***a* and **12***b* are respectively top and bottom plan views of a door reinforcement device **150** integrating a pair of reinforcement members **100**. In the door reinforcement device **150**, two reinforcement members **100** are fixedly connected by a pair of bridges **160** extending from lateral edges of the reinforcement members **100**, at the end of the short sides **112** of the plate **110**. In the door reinforcement device **150**, the two reinforcement members **100** and the pair of bridges **160** form a unitary piece configured for encircling the bolt opening **42** when the door reinforcement device **150** is mounted on the door stile **16**. Although the example of FIGS. **12***a* and **12***b* do not include the indentations **116**, incorporating such indentations in the door reinforcement device **150** is also contemplated.

FIGS. **13***a* and **13***b* are respectively side elevation and perspective views of a door reinforcement device **180** integrating a pair of reinforcement members **100** and a deadbolt guide **190** insertable in the casing **39** that, in turn, is inserted in the bolt opening **42** formed on a door stile **16**. Some deadbolt locks **30** do not include the casing **39** and the deadbolt guide **190** may be directly insertable in the bolt opening **42**. The door reinforcement device **180** integrates features of two reinforcement members **100** and the deadbolt guide **190**. Mounting the door reinforcement device **180** on the door stile **16** may involve inserting the deadbolt guide **190** in the casing **39** present in the bolt opening **42**, or directly in the bolt opening **42** if there is no casing **39**, and using a hammer or like tool to ensure that the hooks **130** penetrate in the material of the door stile **16**. The faceplate **44** may then be installed over the door reinforcement device **180**. An embodiment in which the faceplate **40** is also integrated in the door reinforcement device **180** is also contemplated. The door reinforcement device **180** may be package with a deadbolt lock **30** and be sold as a kit.

FIG. **14** shows a set including a pair of reinforcement members ready to be mounted on a strike jamb **200** of the doorframe **46**. FIG. **15** shows the set including the pair of reinforcement members **100** mounted on the strike jamb **200** of the door frame **46**. A bolt opening **210** is formed in the strike jamb **200** and is aligned with the bolt opening **42** formed in the door stile **16** when the door **10** is closed so that the deadbolt **40** may extend through both bolt openings **42** and **210** for locking the door **10**. The same reinforcement members **100** may be positioned near the bolt opening **210**, the hooks **130** being inserted in the material of the door frame **46**, to strengthen the strike jamb **200**. FIG. **16** shows a strike plate **220** and a latch plate **230** mounted on the strike jamb **200** of the door frame **46** over pairs of reinforcement members **100**. Instead of mounting the reinforcement members **100** on the strike jamb **200**, the door reinforcement device **150** of FIGS. **12***a* and **12***b*, or a device integrating the strike plate **210** and the reinforcement members **100** as a unitary piece, may alternatively be mounted on the strike jamb **200**.

Although not shown on FIG. **16**, two pairs of reinforcement members **100** are mounted on the strike jamb **200**. One pair is mounted near the bolt opening **210**, as shown on FIG. **15**, and is hidden by the strike plate **220**. Another pair is

mounted near a latch opening **240**, which is also formed on the strike jamb **200**, and is hidden by the latch plate **230**. Given that the strike jamb **200** may have a width that is greater than the width of the door stile **16**, the strike plate **220** and the latch plate **230** may also be larger than the faceplate **44**. As such, using reinforcement members that are wider than those configured for mounting on the door stile **16** may be contemplated.

The door frame **46** may be further reinforced by the mounting of a door reinforcement set. FIG. **17** is a first side view of a back plate **250**. FIG. **18** is a second side view of the back plate **250** showing a plurality of projections **260** that, in various embodiments, may be similar or equivalent to the hooks **130**, some of the projections **260** optionally comprising barbs similar to the barbs **131**. FIG. **19** is a perspective view of the back plate **250**. Considering FIGS. **17-19**, the back plate **250** has a generally rectangular shape having a plurality of small apertures **270** as best seen on the side view of FIG. **17**. In the non-limiting embodiment of FIGS. **17-19**, the projections **260** are formed by perforating the back plate **250** to form the apertures **270** and bending the material released from the apertures **270** into the projections **260**. One or two larger apertures **280** (two are shown) adapted for matching the bolt opening **210** and the latch opening **240** formed on the strike jamb **200**. Use of a smaller back plate **250** having a single aperture **280** matching the bolt opening **210** is also contemplated. It is noted that FIGS. **17-19** illustrate a prototype of the back plate **250** constructed from an ordinary mending plate. A practical realization of the back plate may have a different shape or form factor, and may include fewer apertures **270** and fewer projections **260**.

FIG. **20** is a cross-sectional side view of the door frame reinforcement kit mounted on a strike jamb **200**. The back plate **250** has been positioned on an inner face **202** of the strike jamb **200** and temporarily maintained in place, for example by placing a rod (now shown) through the bolt opening **210** and through the aperture **280** of the back plate **250**. Two reinforcement members **100** (or the door reinforcement device **150**) are mounted on an outer face **204** of the strike jamb **200**, as shown on FIG. **15**. Screws **290** are inserted through screw openings of the strike plate **220** and through the internal openings **120** of the reinforcement members **100**. The screws **290** are driven through the material of the strike jamb **200** and through the back plate **250**. Holes may have previously been drilled in the strike jamb **200**. An installer may prefer using self-drilling screws for forcing the screws **290** through the back plate **250**. As the screws **290** are tightened, the projections **260** are driven to penetrate in the material of the strike jamb **200**. The combination of the two reinforcement members **100** and of the back plate **250** on opposite faces of the strike jamb greatly improves the impact resistance of the strike jamb **250**.

In a variant, the strike plate **250** may be integrated with the reinforcement members **100** to form a unitary piece. In another variant, the plate **250** may be provided without the small apertures **270** and the screws **290** may be of the self-drilling type, able to penetrate through the material of the plate **250**. Although not shown on FIG. **20**, the reinforcement members **100** and the strike plate **220** may be inserted in a mortise formed on the outer face of the strike jamb.

A door security kit may include various components of the above described embodiments. For example and without limitation, a door security kit may include four reinforcement members **100** and the back plate **250**, for positioning in the manners shown on FIGS. **9** and **20**. A door security kit may alternatively include two door reinforcement devices **150** and the back plate **250**, the door reinforcement device **180**, two reinforcement members **100** and the back plate **250**, or any other equivalent combination.

FIG. **21** is a front view of the door stile **16** of the faceplate **44** and of the deadbolt **40** after impact on the door **10**, the door stile **16** being reinforced by the addition of a pair of reinforcement members **100**. FIG. **22** is a side view of the door stile **16**, of the faceplate **44**, of the deadbolt guide **190** and of the pair of reinforcement members **100** after impact on the door. FIG. **23** is a front view of the pair of reinforcement members **100** on the door stile **16** after impact on the door **10**. These FIGS. **21**, **22** and **23** show test results obtained after provision on the door **10** of an impact of similar magnitude as used to provide the result of FIG. **6**. In the context of these tests, the reinforcement members **100** were installed on the door stile **16**, and the door **10** was mounted on the door frame **46** with the metal subframe **46**A (FIG. **4**) so that, in that configuration, a major portion of the eventual damage on the door assembly would be sustained by the door **10** itself, as in the case of FIG. **6**, and not on the door frame **46**.

In more details, FIG. **21** shows that the door **10** has not cracked along the door stile **16** and that there is some damage on the faceplate **44** and that the steel sheets **28** are not significantly bent in areas close to the bolt opening **42**. Surprisingly, the deadbolt **40** broke out of the door **10**; in this context, the deadbolt **40** has become the weakest part of the door assembly. FIG. **22** further shows damage on the faceplate **44**. On FIG. **22**, a deadbolt guide **41** (not integrated with the reinforcement members **100**) was extracted in part from the bolt opening **42**, after execution of the test, in order to show that the reinforcement members **100** have remained in place in the mortise **48** formed in the door stile **16**. FIG. **23** also shows that the reinforcement members **100** have remained in place. A part of the bolt extension **38** is visible, owing to the removal of the broken deadbolt **40**.

While tests have not been formally executed using the Standard Test Methods for Security of Swinging Door Assemblies (ASTM F476-14), it is expected that a conventional laminated door **10** installed in a standard wooden frame **46** (without the metal subframe **46**A) would only reach level **1** as defined in ASTM F476-14 and that the same laminated door **10** installed in the same wooden frame **46**, with addition of the present home reinforcement members, could at least reach level **3** as defined in ASTM F476-14. Actual results may depend on the quality of other hardware, such as the door latch or deadbolt **40**, mounted on the door **10**.

Those of ordinary skill in the art will realize that the description of the reinforcement member for a door, the door reinforcement set, the door reinforcement device, the door frame reinforcement kit and the door security kit are illustrative only and are not intended to be in any way limiting. Other embodiments will readily suggest themselves to such persons with ordinary skill in the art having the benefit of the present disclosure. Furthermore, the disclosed reinforcement member for a door, door reinforcement set, door reinforcement device, door frame reinforcement kit and door security kit may be customized to offer valuable solutions to existing needs and problems related to the weaknesses of laminated doors and of related door frames. In the interest of clarity, not all of the routine features of the implementations of the reinforcement member for a door, the door reinforcement set, the door reinforcement device, the door frame reinforcement kit and the door security kit are shown and described. In particular, combinations of features are not limited to those presented in the foregoing description as combinations

of elements listed in the appended claims form an integral part of the present disclosure. It will, of course, be appreciated that in the development of any such actual implementation of the reinforcement member for a door, the door reinforcement set, the door reinforcement device, the door frame reinforcement kit and the door security kit, numerous implementation-specific decisions may need to be made in order to achieve the developer's specific goals, such as compliance with application-, system-, and business-related constraints, and that these specific goals will vary from one implementation to another and from one developer to another. Moreover, it will be appreciated that a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking of engineering for those of ordinary skill in the field of home security having the benefit of the present disclosure.

The present disclosure has been described in the foregoing specification by means of non-restrictive illustrative embodiments provided as examples. These illustrative embodiments may be modified at will. The scope of the claims should not be limited by the embodiments set forth in the examples, but should be given the broadest interpretation consistent with the description as a whole.

What is claimed is:

1. A door reinforcement device for mounting on a door stile of a door, comprising:

two reinforcement members, each reinforcement member comprising:

a plate; and

a plurality of hooks extending on one face of the plate;

wherein each reinforcement member is shaped for mounting on the door stile on a respective side of a locking member opening formed on the door stile and for being maintained on the door stile by insertion of the hooks in a material of the door stile, a width of the plate being configured for allowing the plate to be contained within a width of the door stile;

wherein the two reinforcement members are fixedly connected by a pair of bridges extending from lateral edges of the two reinforcement members so that the two reinforcement members and the pair of bridges form a unitary piece configured for encircling the locking member opening when the door reinforcement device is mounted on the door stile;

wherein the one face of the plate is configured for coming in contact with the material of the door stile when the hooks are fully inserted in the material of the door stile;

wherein the material of the door stile is reinforced by full insertion of the hooks in the material of the door stile;

wherein each plate has a generally rectangular perimeter;

wherein the generally rectangular perimeter of each plate includes two opposite short sides and two opposite long sides perpendicular to the short sides, the long sides defining the width of that plate; and

wherein one of the long sides of each plate includes an indentation adapted for allowing movement of a locking member when the reinforcement device is mounted on the door stile.

2. The reinforcement device of claim **1**, further comprising one or more barbs formed on one or more of the hooks.

3. The reinforcement member of claim **1**, wherein:

the plate includes an internal opening within the generally rectangular perimeter;

the hooks are neighbors to the internal opening;

the hooks are distributed on two rows on both sides of the internal opening; and

the plate further comprises additional openings adjacent to the internal opening.

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